

## Airshow Accidents and Incidents 2017

Des Barker

The tenets expressed in this review are those of the author and addresses a sample of significant accidents and incidents at aerial events worldwide in 2017, both during the actual events and during rehearsals and includes, airshows, air races, flypasts, and air capability demonstrations; in fact, any event at which an aircraft is displayed or rehearses for a public air event in which the flow of the event is jeopardised, or reputational damage could accrue.

### Introduction

So, the question the display community has been asking since 2011 has been answered. Following the disastrous 2010 display season during which the highest number of airshow accidents were recorded, the 'in your face' safety campaigns launched by ICAS, EAC and ASSA delivered a significant decrease in accidents. Consensus was reached that the decline had to be arrested.

From 2011 to 2014, regulators and the airshow community were patting themselves on the back with statistical evidence of 'decline arrest' clearly evident. The concern was always "were we seeing a definite decrease worldwide accruing from the contributions of the display pilots, safety officers, air bosses, airshow organisers and spectators, or was it just a statistical spike?"

In absolute terms though, from 41 accidents in 2010, to 19 in 2014, the downward trend has now been reversed with 25 accidents during 2015, 28 in 2016 and 30 in 2017.

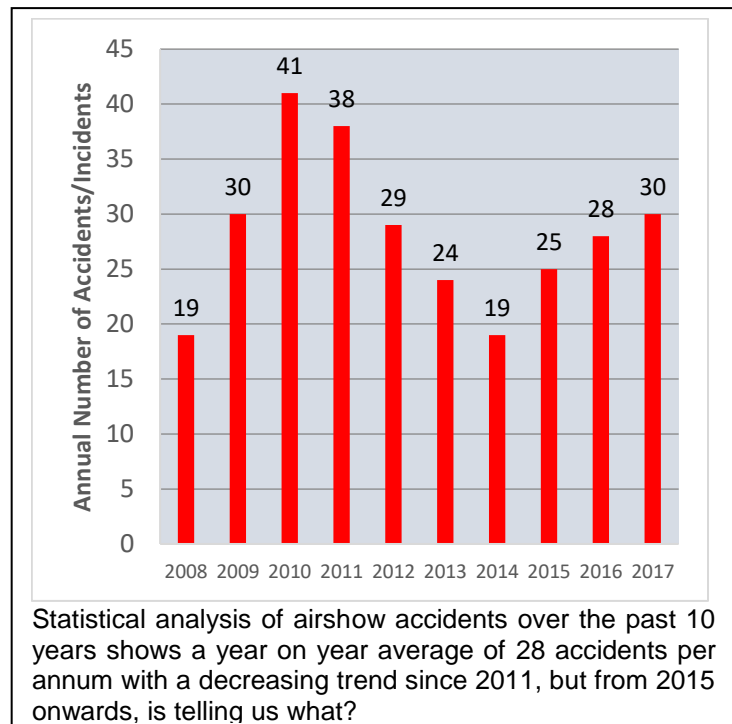
Sadly, and at the expense of melodrama, there is nothing new under the sun. Due to the fickleness of man's decision making, highly experienced pilots have in some cases, continued making the same errors in judgement over the past 109 years of airshows?

Note, not '**pilot error**' but rather '**error of judgement**'. The term error has connotations of negligence or incompetence, which is clearly not the case in these accidents. Display pilots do not intentionally have accidents but make their decisions based on the environmental factors, energy states and attitude of the aircraft in terms of a particular manoeuvre – sadly though, as humans, our ability to continually make consistently accurate decisions within the hazardous low-level display arena, remains questionable.

### 2017 OVERVIEW

Despite the 30 accidents and incidents recorded during 2017, relatively speaking, 2017 was one of the best airshow safety years in many years in terms of loss of life and casualties, only 14 casualties/fatalities but with 7 pilots killed versus the annual average of display pilot deaths of 14 per annum since 2000. Although there were only 19 accidents in 2014, there were 13 casualties/fatalities including 12 display pilots.

This report does not seek to pass judgement on the accident other than reporting on information in the public domain in an effort to identify and alert the airshow community to accident trends in airshow safety worldwide. What can be concluded was that airshow 'guardian angels' worked overtime in 2017



to reduce the number of fatalities at air events worldwide. Similarly, Air Bosses and Safety Officers were challenged to deal with the unintended consequences of hosting airshows.

## 2017 STATISTICAL OVERVIEW

### Casualties

A total of 30 accidents and incidents were recorded which included an unacceptable 14 casualties/fatalities in which 7 pilots lost their lives and 2 pilots were injured. The loss of lives to 2 passengers, one the wife of the display pilot, and 1 injured, raises the question as to why display pilots would include passengers on a low-level display flight, even if it was only a 'flyby' - when will we ever learn that the passengers on a low-level display merely increases the casualty toll in the event of an accident.

As long as display pilots continue to offer passengers the opportunity to fly along during a display, we will continue to lose additional lives unnecessarily. There can never be a good reason to take a passenger on a low-level display. In questioning the distance of the display line from the spectator enclosure, particularly at the smaller airfields, 1 spectator was injured by a flailing propeller from a Spitfire take-off accident.

Parachutists have been an integral part of airshows from the early 1900s and have also paid the ultimate price during public demonstrations of their skills; in 2017, 1 skydiver was killed, and one injured. In strange turn of events, a possible suicide was being investigated after a Belgian Air Force A-109 helicopter pilot fell from the 'chopper' during a parachute drop at an airshow.

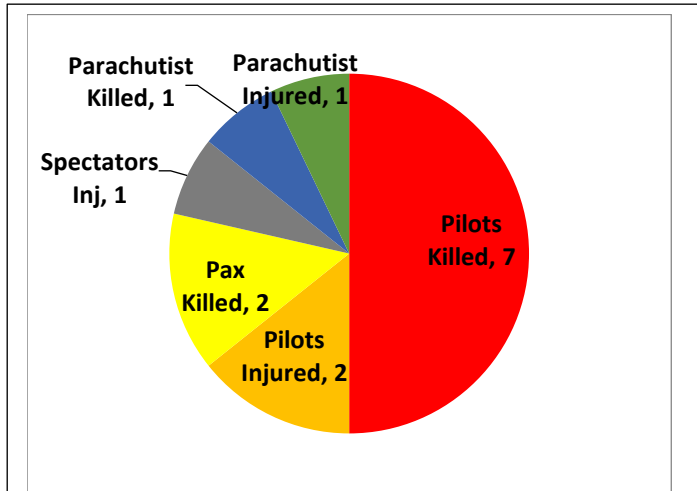
Fatalities remain untenable if the airshow community is to continue to exist without regulatory and insurance interventions since both could impose additional constraints on the ability to host air events. Sponsors are not generally amenable to supporting events in which fatalities occur; not good for their branding at all!

### Causal Factors

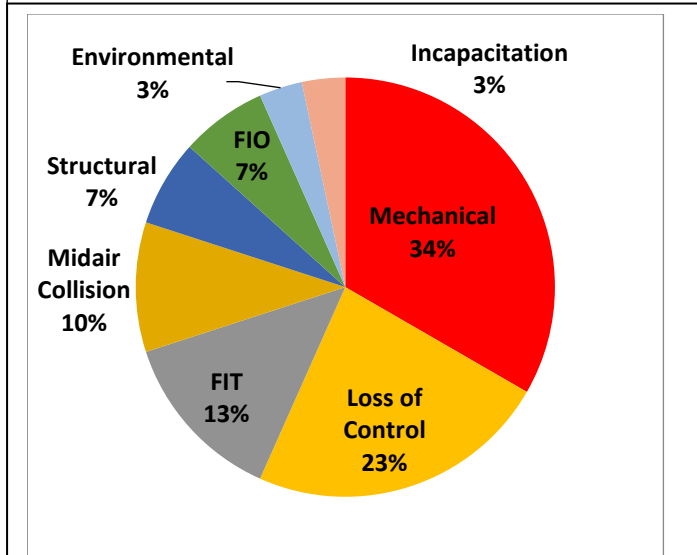
The inordinate contribution of Mechanical failures at 34% skewed the statistics and remains a concerning factor, this against an historical 17% contribution and was mainly attributable to engine and structural failures on vintage aircraft which in turn, were involved in 45% of the airshow accidents and incidents. With the increased participation of vintage aircraft on the airshow circuit, this trend can be expected to remain an issue in future.

Loss-of-Control accidents at 23% was greater than the historical average of 18% but a closer investigation of the actual accidents/incidents show another perspective in that two occurred during take-off and landing in vintage fighters and trainers while three occurred up and away. The reduction in 'up and away' loss of control accidents was heartening and reversed the trend of 'out of control' manoeuvres which have continued unabated throughout the history of airshow accidents.

In what must be considered very good news, only 4 'Flight-Into-Terrain' accidents (13%) occurred which was well below the historical average of 27%. Another positive attribute was that there



Categorisation of airshow accident Casualties 2017.



Airshow accident and incidents 2017 by Causal Factors.

were no accidents accruing from tumbling gyroscopic manoeuvres for the first time in many years. Could it be that display pilots now understand that tumbling manoeuvre trajectories and dynamics are not an exact science and that energy management and error budgets for such downline manoeuvres must be more optimistic?

Could it be that display pilots that include high energy tumbling manoeuvres in their routine now understand the inconsistent and unpredictable nature of energy loss and the importance of maintaining situational awareness regarding the aircraft's trajectory; to terminate the manoeuvre at the first sign of the aircraft's trajectory transitioning to a downward vector - gyroscopic manoeuvres on the downline at low heights are not for amateurs or for that matter, the professionals either!

The FIT accident of the Antonov AN-2 without a Certificate of Airworthiness following a prohibited barrel roll by a pilot without an AN-2 rating, this while carrying a passenger during the conduct of low-level aerobatics, highlighted the requirement for the establishment of an international airshow oversight body to share standards.

The cutting of the ski slope video camera cable at the World Alpine Skiing Championships in St Moritz by a Patrouille Suisse PC-7, once again illustrated the threats and challenges of conducting airshows away from airfields at high publicity events.

Another positive aspect for 2017 was that although the 3 mid-air collisions (10%) approached the historical average of 15%, they were mainly 'sharing paint' except for the two Mustangs at Duxford in which *Miss Helen's* tailplane was partially chewed-up by 'The Shark'.

### Event Categorisation

Historically, 77% of accidents and incidents occurred during actual displays versus 23% during practice; 2017 saw a significantly higher percentage at 90%. The significant disparity between actual airshows and practice however, begs the question, Why? This phenomenon can possibly best be explained by the fact that the pressure to perform during the actual event watched by spectators and at times under hostile atmospheric conditions, places additional stress on the pilot to 'press' the display to capability limits, often with zero error margin.

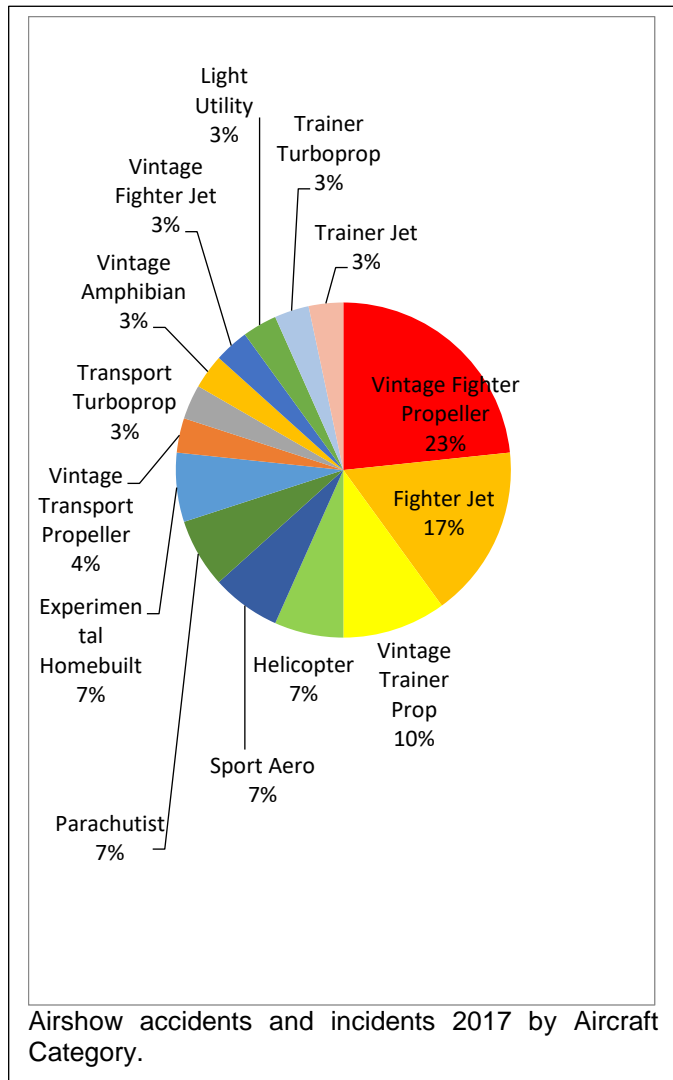
There are often cases in which the conditions during rehearsal are less than ideal and pilots then elect to postpone rehearsals until conditions improve. The problem is that on show day under less than ideal conditions, with the demands from the event organiser and pilot's wanting to meet their fee commitments, pilots sometimes 'press' the performance and environmental boundaries under conditions for which they may not have practiced.

The military adage of "fight like you train" is especially relevant; 'display like you practice' – anything else is pushing the error budget.

### Aircraft Categories

Bearing in mind the reduced participation of military aircraft and the increased number of vintage aircraft at airshows worldwide, vintage aircraft were involved in 45% of the airshow accidents.

Specifically, vintage propeller fighters and trainers which were involved in 34% of the accidents. The fighter jets involved were all 4<sup>th</sup> generation fighters. What



Airshow accidents and incidents 2017 by Aircraft Category.

was of concern was the fact that once again vintage aircraft, as was the case in 2011 through 2016, continued to make up the biggest proportion of aircraft types involved in the accidents.

### Accidents by Country

30 accidents occurred in 15 different countries but for the first time in many years, the UK with 8 airshow accidents and incidents, exceeded the 6 in the USA, despite the fact that the USA most probably has three times the number of airshows than the UK.

2 accidents occurred in Australia, Canada and Russia, while Spain, Austria, Italy, France, South Africa, Belgium, Switzerland, Israel, India and Thailand each suffered 1 airshow accident/incident. Sadly, there are no accurate statistics regarding flying hours flown in practice and during air events against which to make more statistical sense of the accident figures.

### ACCIDENT/INCIDENT OVERVIEW 2017

#### 1. 08 JANUARY 2017: PARACHUTIST, INDIAN AIR FORCE, AGASH GANGA PARACHUTE TEAM, (GANDHINAGAR, INDIA)

It was at the 8<sup>th</sup> *Vibrant Gujarat Global Summit* that an Indian Air Force skydiver from the *Aakash Ganga Team*, flying a three-ship pyramid formation in the saffron, white, and green colours of the national flag, was injured while performing at an airshow as part of the summit.

Shortly after the pyramid split, the accident parachutist's left-hand side of the canopy suddenly began folding in at approximately 30 ft agl and plunged nearly vertically to impact. The Warrant Officer was extremely fortunate to have suffered only a sprained ankle following a very hard landing in which wake interference from the No.2 jumper was suspected as a contributory cause.<sup>1</sup>

#### 2. 14 JANUARY 2017: SAAB JAS-39C GRIPEN (SONGKLA PROVINCE, THAILAND)

Thailand's national Children's Day is celebrated annually on the second Saturday of January but was spoiled for the families when Sqn. Ldr. Dilokrit Pattavee was killed when the Royal Thai Air Force Gripen crashed at Hat Yai Airport during *Thailand's National Children's Day Airshow*.<sup>2</sup>

The Gripen entered show centre in what appeared to be an aileron roll or small barrel roll; the roll rate was too slow for an aileron roll and the trajectory too flat to be a barrel roll. It appeared as if the roll was initiated without stopping the pitch angle excursion while inverted, creating the traditional 'scoop' that has killed so many pilots doing low level rolls. The combination of high speed, low height and a negative trajectory, prevented recovery.

#### 3. 26 JANUARY 2017: GRUMMAN G-73 MALLARD (PERTH, AUSTRALIA)

As part of a two-ship gaggle of aircraft presenting an airshow to the 60,000 spectators gathered along the Swan River celebrating Australia Day, the Mallard had flown along the show line at approximately 150 ft agl and upon reaching the end of the display line, commenced a left-hand, level turn about to return along the reciprocal track.



Consistent with an aerodynamic stall, the bank angle increased and the nose pitched down as the Mallard impacted the Swan River. (Mike Graham)

Through approximately 150° of the turn, the Mallard appeared to decelerate, the bank increased, the nose pitched down consistent with an aerodynamic stall, and the aircraft impacted the water at an angle of approximately 60°, killing both the pilot, Peter Lynch and the passenger, Endah Cakrawati, his wife.<sup>3</sup> Several boats on the water rushed to the aircraft in a desperate attempt to rescue the aircrew. The Perth Skyworks event was expected to attract 300,000 people, but was subsequently cancelled.

<sup>1</sup> The Times of India, *Vibrant Gujarat Global Summit: IAF Paratrooper Injured While Performing at Air Show*, 9 January 2017.

<sup>2</sup> Bangkok Post, *Air Force Jet Crashed During Children's Day Show, Pilot Killed*, 14 January 2017.

<sup>3</sup> Australian Transport Safety Bureau, Investigation Number: AO-2017-013, *Collision with water involving Grumman American Aviation Corp G-73, VH-CQA*, 26 January 2017.

**4. 28 JANUARY 2017: CHANCE VOUGHT F4U-5N CORSAIR (NEW SOUTH WALES, AUSTRALIA)**

The pilot of Chance-Vought F4U-5N Corsair, was forced to make a wheels-up landing just prior to the start of the *Hunter Valley Airshow* at Maitland Airfield after experiencing hydraulic system failure while on a functional test flight.

The pilot was unharmed and damage to the aircraft was essentially bent propeller blades and scraped flaps. The aircraft was lifted by crane and towed back to the hangar and removed from the airshow programme as it could obviously not participate in the airshow.<sup>4</sup>

**5. 17 FEBRUARY 2017: PILATUS PC-7 DEMO TEAM (ST MORITZ, SWITZERLAND)**

St. Moritz, like every other country hosting the Alpine Skiing World championships, lined up other events outside of the competition. They mostly go off without a hitch, but certainly introduce additional threats and challenges to airshow safety in that the surrounding display area is often in conflict with the relatively safe environment of an airfield. Urban areas, mountains, visibility and television cameras are just some of the challenges the Air Boss, Safety Officer and display pilot must include in the safety equation.

Austria's Marcel Hirscher won Giant Slalom gold after a delay caused by the Swiss Air Force PC-7 Demo Team aircraft wing which sliced through the overhead television camera cables for the cameras that swoop up and down the run, providing viewers with a birds-eye view of the racers. It was a near-disaster, such a camera weighs about 20 kilos and could have killed people watching the ski race.

Although the prevailing weather was good, the PC-7 Demo Team approached from over the mountain and were confronted by some low scud patches and during the run-in for a fan break, a PC-7 wing sliced through the cable. The camera fell onto the piste, right into the end of the ski run finishing area. No one was injured but it could have been so different, but the guardian angels had to pull out all the stops, AGAIN! The PC-7 landed safely at Samedan Airport but the airshows that were planned for Saturday and Sunday were cancelled.<sup>5</sup>

**6. 08 APRIL 2017: NORTH AMERICAN T-6 HARVARD (FLORIDA, USA)**

The permutation of accidents that an Airboss must contemplate is infinite; off-field or on-field, any incident adversely affects the ability of the airshow organisers to keep the airshow on schedule for the paying public. Two incidents at the 2017 *Sun 'n Fun*. The first, an aircraft of the *GEICO Skytypers* made a safe emergency landing at the 43<sup>rd</sup> *Sun 'n Fun, International Fly-In & Expo* at Lakeland after encountering engine problems just before the start of the display.<sup>6</sup>

**7. 09 APRIL 2017: CESSNA 310R (FLORIDA, USA)**

The second, a Cessna 310R suffered a left undercarriage collapse and veered off the runway at the *Sun 'n Fun Fly-in* and in the process, closed Runway 27 for an hour. Neither the pilot nor passenger were injured.<sup>7</sup>

**8. 26 APRIL 2017: BOEING F/A-18 HORNET, BLUE ANGELS, (FLORIDA, USA)**

A rare joint flyover with the US Navy *Blue Angels* and the USAF *Thunderbirds* nearly ended in calamity when two of the *Blue Angels'* F/A-18 Hornets momentarily touched and 'swapped paint' while flying in formation. Both aircraft; landed without incident.<sup>8</sup>

**9. 02 MAY 2017: LOCKHEED C130 HERCULES (TEL AVIV, ISRAEL)**

There is always a risk to station keeping if No.2 and No.3 are too far behind Lead and not maintaining the reference features on Lead. An additional challenge is the insidious wing vortex suction drawing the wingmen inwards which pose a threat to longer wingspan aircraft sitting too close to each other. Rule of thumb, "the further back, the wider you must sit while retaining the same plane".

A headline to grab the immediate attention of any display pilot, air boss or safety officer, "2 Pilots Imprisoned Over Near-accident on Independence Day" as two C-130s clipped wings during a VIC, level formation flypast at the annual *Israel Independence Day Flypast*.

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<sup>4</sup> Aviation Safety Network, ASN Wikibase Occurrence # 193159, Chance Vought F4U-5N Corsair VH-III, 28 January 2017.

<sup>5</sup> MailOnline, *Hirschi Wins Giant Slalom World Title After Plane Incident*, 17 February 2017.

<sup>6</sup> thisisflight.net/features/2017-2/preview-2017-airshow-season, 8 April 2017.

<sup>7</sup> 10News, Tampa Bay, *Small Plane Has Hard Landing at Sun 'n Fun Air Show*, 8 April 2017.

<sup>8</sup> The Aviationist, *Blue Angels F/A-18s Make Contact and "Swap Paint" During Flyover: Pilots Land Aircraft Safely*, 02 May 2017.

Two Israeli Air Force pilots were reportedly sent to a military jail over a near-accident that saw two C-130's, the No.2 and No.3, clip wings during the flyover as the wings overlapped by approximately 1 metre. In addition to the internment of the pilots, ten crew members were also grounded. A Channel 2 report said the punishment would last a few days, but gave no exact details.

Although the 'wing clipping' was captured on amateur video, the Israeli Air Force first learned of the incident only after they had landed when scratch marks were found on their wings.<sup>9</sup>

## 10. 06 MAY 2017: PITTS SPECIAL, GOOD YEAR EAGLES (PRETORIA, SOUTH AFRICA)

The end result could have been catastrophic, but once again the 'guardian angels' had to intervene as No. 4 of the *Good Year* 4-ship formation, Nigel Hopkins, split from the loop and pushed out onto the vertical downline after the  $\frac{3}{4}$  point. Speed at the start of the push was around 110 knots at -3G with the speed at the bottom around 160 knots.

Hopkins, World Rallying Flying Champion 2003, Vice-World Advanced Aerobatic Champion 2010 and South African Aerobatic Champion, was extremely fortunate to escape a 'rogue flying radio' in the cockpit while performing at the annual *South African Air Force Museum Airshow*.

There have been several instances like these over the years worldwide, particularly in the older type aerobatic planes which were built before the requirements for transponders, emergency locator transmitters and the likes and as such, additional space and brackets had to be made to fit these kits. The more modern types have catered for this in the instrument panels which provide a more secure installation.<sup>10</sup>

## 11. 14 MAY 2017: SILENCE SA1100 TWISTER, TWISTER AEROBATIC TEAM (OXFORDSHIRE, UK)

One of the two-ship, synchronized *Twister Aerobatic Team* taking part in the *Abingdon Air and Country Show*, was forced to make an emergency landing at Abingdon Airfield after suffering engine failure. Having completed a pullup into a quarter vertical roll transitioning to a 'tail slide' to track back along the display line, upon reaching the airfield boundary, the engine cut out as the aircraft pitched up.

A very quick decision by Chris Burkett, cutting the margins to the absolute minimum at approximately 200 ft agl and heading away from the airfield, he elected to turn back through 180° for an on-field forced landing. Getting the nose down aggressively, there was sufficient energy to turn through approximately 135° before running out of energy and 'pancaking' on-field.

The aircraft rebounded several feet in the air Burkett remained in the aircraft for about twenty minutes before he was lifted out and was then transferred to the hospital where his condition was said to be "breathing and conscious" after suffering two broken vertebrae and sternum due to the high vertical velocity at impact.<sup>11</sup> Burkett recovered within a few months to continue his flying.



IAF 'Shimshon' Hercules heavy transport planes seen over the beach in Tel Aviv during Israel's traditional Independence Day Flyover. (AFP Photo/Jack Guez)



The VHF radio flies out of the instrument panel, narrowly missing Hopkin's face and impacts and cracks the canopy. (Nigel Hopkins)

<sup>9</sup> Alexander Fulbright, The Times of Israel, *2 Pilots Imprisoned Over Near- Accident on Independence Day*, 9 May 2017.

<sup>10</sup> Nigel Hopkins, SAAF Museum Airshow, 6 May 2017.

<sup>11</sup> ASN Wikibase Occurrence # 195369, *Silence SA1100 Twister, G-JINX*, 14 May 2017.

Burkett made an informed operational choice and survived. Display pilots flying low level aerobatics know and accept the risks. Engine cuts at each and every point of the manoeuvre are not practiced but, in similar vein to helicopter operations, there is a 'height/velocity curve' for a fixed wing airplane within which that band of height and airspeed, sufficient total energy is available for a turn-back and successful power off landing.

## 12. 14 MAY 2017: AVRO 504K REPLICA (OXFORD, UK)

A separate incident occurred two hours later at the *Abingdon Air and Country Show* as a replica Avro 504, on debut as part of the multi-aircraft *Great War Display Team*, made an emergency landing after suffering catastrophic engine failure on its 150 hp Rotec radial engine. A safe forced landing on the aerodrome resulted in no further damage.

The excessive RPM used to keep up with the other faster aircraft was considered contributory by one of the display pilots. The original 504's had huge diameter propellers, but this example had a much smaller diameter so much of its efficiency would have merely gone into cooling the engine since little of the blade would have projected outside the cowling diameter.

Dan Griffith had just completed his part of the routine and was clearing as the rest of the team dived in on the B axis. As they broke, Griffith called "Avro, engine failure". At this point the rest of the team went to standard briefed SOP and stopped the display and climbed into the overhead. The *Great War Display Team* continued after Griffith called "safe on the ground".<sup>12</sup>

## 13. 19 MAY 2017: SUPER CUBS MACKY SQ2 (TALKEETNA, ALASKA)

The SQ2 is a highly modified STOL aircraft that was competing in the Slow Speed Competition at the *Talkeetna Fly In* which required flying the aircraft at the very edge of the low speed envelope. The slowest recorded speed was 17 mph which earned the pilot first place in the competition.

At approximately one-half wingspan above the runway, the left wing rolled off to the left, the left wing clipped the runway and slewed the aircraft around through 300°, fortunately with no injury to the pilot.<sup>13</sup>



With very little excess energy available for a 'flared landing' or undercarriage extension, the Twister 'pancaked' on-field. (<https://www.youtube.com/watch?v=Y3hARxTtCtI>)



Demonstrations at low height on the stall boundary impose an additional set of skilled handling criteria. (YouTube)



The display is never over until the aircraft is refuelled, signed off and locked away safely in the hangar. (UK Airshow Review Message Board)

<sup>12</sup> [www.airshows.org.uk](http://www.airshows.org.uk), *Review: Abingdon Air & Country Show*, 17 May 2017.

<sup>13</sup> [www.youtube.com/watch?v=wWrG3\\_YqGZc](https://www.youtube.com/watch?v=wWrG3_YqGZc), 2017 Talkeetna Fly In, 22 May 2017.

**14. 25 MAY 2017: BELL AH-1 COBRA HELICOPTER, FLYING BULLS (TYROL, AUSTRIA)**

The AH-1 Cobra operated by the Red Bull *Flying Bulls* suffered a heavy damage mishap on completion of its display at the opening of a nearby pedestrian suspension bridge, including flypasts below the bridge, when it returned to Reutte-Höfen Airport to refuel. The main rotor blades contacted a building, causing the tail to be torn off and the main rotor to be severely damaged, fortunately no one onboard or on the ground was injured.<sup>14</sup>

**15. 27 MAY 2017: DE HAVILLAND SEA VIXEN (YEOVILTON, UK)**

The Royal Navy Historic Flight Sea Vixen, the only flying Sea Vixen in the world, was forced to do a wheels-up landing back at its home base at RNAS Yeovilton after its display at the *Duxford Airshow*. The loss of hydraulic pressure meant a flapless, 'undercarriageless' landing after in-depth discussions with engineers.

Commander Simon Hargreaves performed a text book, controlled wheels-up landing and walked away without injury while damage was confined to the underwing tanks and lower rear fuselage. Hargreaves jettisoned the canopy during the landing rollout to facilitate egress.<sup>15</sup>



With no other option after hydraulic failure, a wheels-up landing was the only other alternative for the Sea Vixen. (Scott Dabinett)

**16. 28 MAY 2017: PARACHUTIST, LEAP FROGS, (NEW JERSEY, USA)**

Remington Peters, a member of the U.S. Navy's skydiving team, the *Leap Frogs*, died after his parachute malfunctioned during a *Fleet Week Airshow* at Liberty State Park in Jersey City.

Four *Seals* dropped from a helicopter, but Peter's parachute failed to open properly and he impacted the Hudson River adjacent to Liberty State Park and was immediately retrieved by U.S. Coast Guard first responders and taken to a hospital where he was declared dead. The main parachute, which had become separated from Peters during his descent, was found in a nearby parking lot. The rest of the team landed safely in Liberty State Park.<sup>16</sup>

**17. 04 JUNE 2017: SUPERMARINE SEAFIRE MK III, (BEDFORDSHIRE, UK)**

The Seafire was landing at Old Warden in the morning prior to the 'Fly Navy' event in the afternoon. The runway was a bit shorter than the airfield that the Seafire usually operated from. From video, a crosswind approach and a high rate of descent on touchdown on left wheel resulted in hard landing damage to the left wingtip and the undercarriage flipper door.

No injuries, understandably just a very upset pilot. Possible wind shear with a fair crosswind was considered as contributory factors. The aircraft was removed from the flying programme and obviously did not fly in the airshow.



Seafire high angle of attack, hard landing impact of left wheel flipper door and wing tip. (Airplane Pictures, Nigel Paine)

<sup>14</sup> Aviation Safety Network, ASN Occurrence # 195658, Bell TAH-1F Cobra, N11FX, 25 May 2017.

<sup>15</sup> ASN Wikibase Occurrence # 195701, De Havilland DH110 Sea Vixen FAW 2, 27 May 2017.

<sup>16</sup> Airshow News, *US Navy Leap Frog Killed During Fleet Week Accident*, 28 May 2017.



**18. 05 JUNE 2017: GLOSTER GLADIATOR (BEDFORDSHIRE, UK)**

The finale on the Sunday of the 'Fly Navy airshow focussing on naval aviation heritage, consisted of a six-aircraft Balbo of two elements of three, one of which included a Gladiator (one of only two airworthy in the world), leading a three-ship VIC formation of Lysander and Hawker Demon.

The Gladiator's engine was back-firing badly as it flew overhead but then dropped from the formation because of engine failure and descended out of sight behind the trees, landing in a young crop of wheat adjacent to the airfield. A good show, the pilot landed the aircraft without additional airframe damage, walking away, uninjured.<sup>17</sup>

**19. 11 JUNE 2017: SUPERMARINE SPITFIRE PR XIX, (LORRAINE, FRANCE)**

Not a good year for vintage propeller fighters as Cedric Ruet, at the controls of a 2050 hp Griffon powered, Spitfire, PR XIX, PS890, lost control during take-off when the propeller dug into the ground, flipping the aircraft over onto its back in a cloud of dust at the *Longuyon-Villette Airshow*. One lady spectator was injured when the propeller splintered and flew through the air and hit her.

From the video, Ruet applied full power to the Griffon engine for the take-off run and nearly immediately lifted the tail. With the torque depressing the right oleo, the right wing dropped slightly allowing the propeller to dig into the soft runway. Two propeller blades disintegrated while the third flew out of shot while the Spitfire torqued onto its back with a broken starboard main wing spar.

Typical of small, uncontrolled airfield events, with very little emergency services on 'cockpit readiness' on-site, the Spitfire fortunately did not catch fire and spectators rushed onto the runway to lift the aircraft with their hands to release the injured Ruet who was trapped underneath.<sup>18</sup>



Early rotation during take-off enabled the propeller to dig into the soft runway when engine torque depressed the right oleo. (Service Communication Mairie de Lounguyon)

**20. 23 JUNE 2017: GENERAL DYNAMICS F-16, USAF THUNDERBIRDS, (OHIO, USA)**

An USAF *Thunderbirds* two-seater F-16 conducting a single-ship familiarisation flight in preparation for the *43rd Vectren Dayton Airshow* the next day, flipped over while landing in rain with winds gusting at 20 kts and visibility at 1.5 miles.

The F-16 landed deep at 163 KIAS instead of 138 KIAS as the pilot, Capt. Erik Gonsalves battled to see the runway due to standing water on the canopy; contributory causes mooted possible aquaplaning.

First responders faced a real challenge dealing with the two-crew inverted in their live ejection seats that would have experienced quite an acceleration when the F-16 'flipped over'.<sup>19</sup> The Dayton show continued but without the *Thunderbirds*.<sup>20</sup>



The crew were eventually extracted from the flipped over F-16 after about two hours. (2News, wdtn.com)

<sup>17</sup> FlyingNews.com, *Emergency Landing – Gloster Gladiator Engine Problem – Shuttleworth Fly Navy Airshow 2017*, 8 June 2017.

<sup>18</sup> Luke Barnes, Mail Online, *Spitfire Preparing to Takeoff at French Airshow Nosedives Into The Ground*, 12 June 2017.

<sup>19</sup> Adam Weinstein, Task & Purpose, *Air Force Thunderbirds F-16 Crashes At Air Show In Ohio*, 23 June 2017.

<sup>20</sup> Stephen Losey, AirForceTimes, *Thunderbirds Jet Landed Too Fast, Skidded Off Wet Runway in June Crash*, 3 November 2017.

**21. 07 JULY 2017: BRISTELL NG-5, (TAMBOV, RUSSIA)**

The pilot of a Bristell NG-5 was killed in an accident during an airshow honouring students graduating from the local Tambov State University Ball.<sup>21</sup> During mid-routine, the pilot pulled up into a loop and passing the 270° point, it appeared as if he pulled too tightly during the recovery pull-out, causing the aircraft to autorotate and depart to the right, completing a two-turn spin before impacting the ground.

**22. 08 JULY 2017: NORTH AMERICAN P-51 MUSTANG (BEDFORDSHIRE, UK)**

2017 marked the 25<sup>th</sup> *Flying Legends Airshow*, a world famous aerial spectacular that was held at the iconic Duxford Airfield on 8 and 9 July, unbeknown that it would be subjected to two Mustang accidents. *Berlin Express*, an example of a P-51B and marked as the Mustang that flew under the Eiffel Tower in pursuit of a Bf109G 'Gustav' in 1944 then shot it down, had flown over from Texas the previous week especially for the event.

Nick Grey was making a high-speed diving entry from 4,500 ft agl and 360 KIAS with the intention of pulling up into a loop when the canopy shattered and impacted the vertical fin and right-hand stabilizer as it cleared the aircraft. The Malcolm Hood was designed for the Spitfire but was subsequently retrofit to the Berlin Express to improve the pilot's field of view.

'Canopyless', the *Berlin Express* came back around and landed without further incident although the airshow was delayed as airfield maintenance personnel were picking up bits of the plexiglass off the runway for quite a while!"<sup>22</sup>



The 'convertible' *Berlin Express* recovers for landing after catastrophic canopy failure. (Dr Stefan Bouwer)

**23. 09 JULY 2017: NORTH AMERICAN P-51D MUSTANG (BEDFORDSHIRE, UK)**

Watched by a 15,000-strong group of spectators, Mark Levy, flying *Miss Velma* at the *Flying Legends Airshow* at Duxford was forced to break from the last of the six three-ship formations in a Balbo and make an emergency landing off-field adjacent to Duxford after suffering engine failure.

During the final run-in, Levy reported a rough running engine, instinctively realising that an emergency landing was inevitable. On base leg he realised that he was not going to reach Runway 24 and decided to land straight ahead in a wheat field and retracted the undercarriage a split second before the



Following engine failure, the pilot was left with no option but a forced landing in an adjacent field. (Paul



Not a year goes by without a vintage aircraft loss of control accident during take-off or landing. (CBC News)

<sup>21</sup> RT News, *Horrifying Footage Shows Fatal Plane Crash at Russian University Prom Airshow*, 7 July 2017.

<sup>22</sup> Dr. Stefaan Bouwer, Aviation Photographer.

landing. Thankfully, good handling skills ensured that Levy was unhurt although the Mustang was substantially damaged by a concrete block hidden by the vegetation.<sup>23</sup>

**24. 09 JULY 2017: NORTH AMERICAN T-6 HARVARD MK.4 (ONTARIO, CANADA)**

The *Wings and Wheels Airshow* at the Billy Bishop Regional Airport near Owen Sound didn't quite go as planned. A T-6 Harvard Mk.4 flipped over on landing after its display; both the pilot and a fare paying passenger being flipped, received minor injuries. The Harvard departed the runway, hit an earth berm and flipped over.<sup>24</sup>

**25. 26 AUGUST 2017: CANADAIR CT-114 TUTOR, (NOVIA SCOTIA, CANADA)**

*Snowbird* No.5 stopped well short of the end of the runway with a nosewheel fire after landing at CFB Greenwood during the *Atlantic Canada International Air Show*. As the Tutors landed, No. 5 stopped well before the end of the runway after a small fire was spotted around the nose wheel and two fire trucks rushed out to the runway to extinguish the flames. Capt. Matthew Hart and Capt. Kevin Domon-Grenier, who was still in training, were in Snowbird No. 5 when the fire occurred.<sup>25</sup>

**26. 02 SEPTEMBER 2017: ANTONOV AN-2T (MOSCOW, RUSSIA)**

If ever there was an accident that demonstrated why airshow safety oversight worldwide should resort under a single, virtual board, it was this one. With an average of 28 airshow accidents and incidents annually, worldwide, there is an urgent need to preach, implement and share the 'airshow gospel' across all countries in an attempt to reduce airshow accidents.

This particular airshow accident in which the AN-2 pilot Dmitry Sukharev, and an amateur photo journalist, Boris Tylevich, were killed, raised many questions by regulators and display pilots alike. Their Soviet-era biplane AN-2 ploughed into the airfield at Balashikha while flying a display dedicated to the 70<sup>th</sup> Anniversary of the AN-2.

Video analysis revealed that the AN-2 exited a barrel roll and then entered a very tight left-hand turn spiralling into the ground, possibly trying to avoid overflying the spectator enclosure. Bank angle was very close to 90°! Without an upward lift vector, Newton's gravitational laws will always prevail. No attempt was made to reduce the bank angle in the descending turn until the left wing clipped the ground and slewed the AN-2 into a ball of flames. The demonstration flights were stopped after the crash.

The Russian Aviation Regulator Rosaviatsia reported that the Certificate of Airworthiness of the aircraft had expired almost five years ago in November 2012. In addition, the pilot did not have an AN-2 Type Rating nor was the aerobatic manoeuvres performed, permitted on the AN-2.<sup>26</sup>

**27. 03 SEPTEMBER 2017: AGUSTA 109 (LIEGE, BELGIUM)**

A bizarre headline in the Belgian media read: "Belgian Military Pilot Falls From Helicopter During Air Show". A body has been discovered in the Amay valley by the police in the search for a pilot who fell out of a military helicopter during an airshow in eastern Belgium.

Three skydivers had jumped with parachutes from an Agusta A-109 helicopter at 4,000 ft agl. The co-pilot monitoring the three parachutists jump, felt the helicopter lurch forward but then turned to see the pilot's seat empty and the sliding door alongside the pilot seat open and the radio cord disconnected. He then grabbed the controls and landed the helicopter safely.

Belgium's *Nieuwsblad* reported that investigators suspected suicide as a possible motive, all indications being that he jumped voluntarily. The broadcaster RTL reported details of marital difficulties and that pilot Vincent Valkenberg had recently separated from his wife and two young children.



Split seconds before impact after exiting a barrel roll. Why prohibited manoeuvres, low level, at an airshow? (YouTube)

<sup>23</sup> World Warbird News, "Miss Velma" and "Berlin Express" Damaged In Separate Incidents at Flying Legends, 11 July 2011.

<sup>24</sup> Kitchener TV News, *Plane Flips Into A Field During Air Show East of Owen Sound*, 9 July 2017.

<sup>25</sup> CBC News, *Snowbird Catches Fire on Runway after Nova Scotia Air Show*, 27 August 2017.

<sup>26</sup> Aviation Safety Network, ASN Preliminary, *Antonov AN-2T*, 2 September 2017.

**28. 23 SEPTEMBER 2017: NORTH AMERICAN P-51D MUSTANG (CAMBRIDGESHIRE, UK)**

Guardian angels were once again called in to create a rather lucky escape for a pilot during the *Battle of Britain Air Show* at the Imperial War Museum, Duxford, when two P-51 Mustangs clipped each other while forming up to escort a B-17, *Sally B* that was in a right-hand turn.



Loss of Visual! Lucky break? You bet! *Miss Helen's* left-hand tailplane was chewed by *The Shark's* propeller during a formation join-up on B-17 'Sally B'. (Cambridge News)



Composite picture of Typhoon impacting the ocean exiting a loop. (Simone Grossi/repubblica.it)

The two Mustangs flying abeam of each other approached from the rear in a left-hand turn and closing on the B-17. Both committed to a turn reversal to achieve the same plane as the B-17 and in the process, *Miss Helen* got ahead of *The Shark*, and lost visual with *The Shark*. It is not clear which Mustang was the element lead.

Both Mustangs were focused on achieving VIC station on each of *Sally B's* wings, that visual contact with each other and situational awareness was lost with the inevitable result being a midair collision. The join-up was aborted and a MAYDAY was called.

*Miss Helen* sustained damage to the left hand horizontal stabilizer after being hit by *The Shark's* propeller which in turn suffered bent blades. Both Mustangs, *Miss Helen* and *The Shark* (G-SHWN) landed safely. Sometimes we just get so lucky, and other times, not.<sup>27</sup>

**29. 24 SEPTEMBER 2017: EUROFIGHTER F-2000 TYPHOON (TERRACINA, ITALY)**

Media headlines reported: "Italian Eurofighter Typhoon Crashes During Terracina Airshow Killing Test Pilot" after an Italian Air Force Typhoon crashed into the ocean coming out of a loop during its display on the seafront at Terracina.

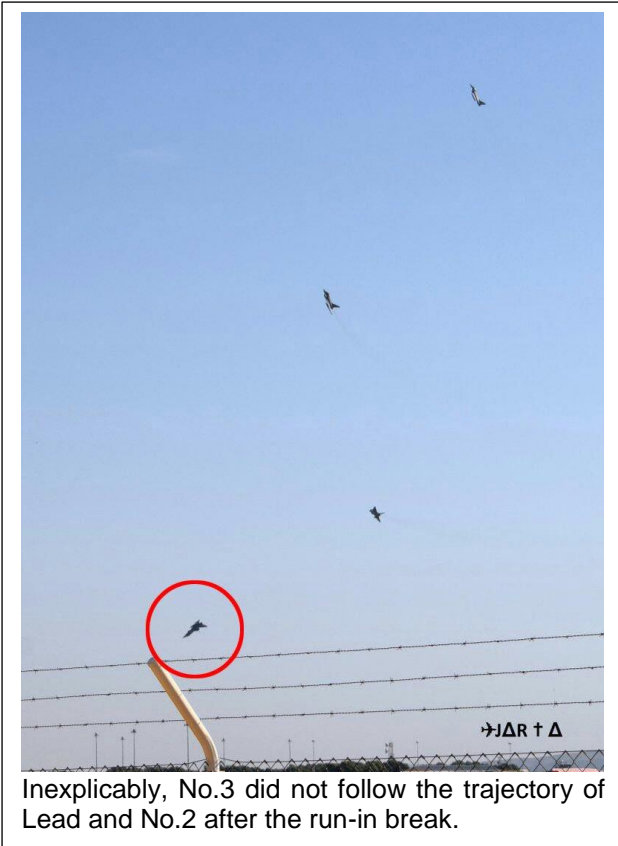
The Typhoon belonged to the Reparto Sperimentale Volo (Test Wing). The pilot Capt. Gabriele Orlandi, for unknown reasons, did not eject.<sup>28</sup> Even with all the most modern technology and electronic cueing to the pilot, the fickleness of human judgement is reflected in this unfortunate accident.

**30. 12 OCTOBER 2017: EUROFIGHTER TYPHOON F-2000 (MADRID, SPAIN)**

A Eurofighter, one of a four-ship formation participating in the *Spanish National Day Parade*, crashed on its return to base in south-eastern Spain, killing its pilot, Cap. Borja Aybar. Inexplicably, No.3 in the four-ship run-in and break, initially broke as to follow Lead and No.2 and then departed to the right without

<sup>27</sup> Aviation Safety Network, ASN Wikibase Occurrence # 199950, *North American P-51D, G-BIXL*, 23 September 2017.

<sup>28</sup> <https://theaviationist.com/2017/09/24/italian-eurofighter-typhoon-crashes-during-terracina-airshow-killing-test-pilot/#jyjdZbDZ8Ji40Mvv.99>



Inexplicably, No.3 did not follow the trajectory of Lead and No.2 after the run-in break.

following the trajectory of Lead and No.2 but instead, rolled inverted in a downward trajectory. Aybar did not eject and died in the accident. At the time of reporting, the Accident Investigation Board had not yet been concluded.<sup>29</sup>

**CONCLUSION**

Based on statistical evidence, as an international airshow community, we seem rather limited in our ability to reduce airshow accidents and incidents and we have not been able to arrest the decline effectively which raises the question: “can we afford then to just continue and accept an average of 28 accidents/incidents per annum over the past ten years.

We continue to lose approximately 13 display pilots per year on average and have not yet managed to consistently prevent any passenger or spectator deaths or injuries. Once again high profile airshow accidents drew emotional media attention to the hazards which are constant reminders of our all-too-human frailties and of the risks we all take when we step into the cockpit.

It is pointless to introduce additional regulations, there are already enough in place; what is required, however, is to zero in on

human factors across the entire airshow community, from first responders, through vendors, safety officers and display pilots alike, through a continuous ‘in your face’ safety programme, which includes occupational health and safety.

Considering the fact that airshow accidents is a worldwide phenomenon, there is an urgent need to preach, implement and share the ‘airshow gospel’ and ‘lessons learned’ across all countries in an attempt to reduce airshow accidents.

The purpose of this report is not for shock value; it is not to preach. It is so that we all may learn. Airshow flying is hazardous and despite all our preparations, our skills, and our training, something may still go wrong. And if something should go wrong, we only hope that others may learn from our experience, so that it won’t happen again. Based on the fickleness of human judgement in the low-level display environment, we need to understand that we are the weakest link in the safety chain.”

<sup>29</sup> Aviation Safety Network, ASN Wikibase Occurrence # 200352, Eurofighter EF-2000 Typhoon, 12 October 2017.