

# Airshow Accidents and Incidents 2016

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 2016, 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.

## 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?"

Unfortunately, there are no accurate figures available for the number of air events worldwide, nor the number of hours flown annually from which to draw scientific conclusions. However, it is conservatively estimated that there are at least 860 air events annually worldwide viz USA 400, Asia and Middle East 100, Europe 300, Australia/Pacific 30 and Africa 30.

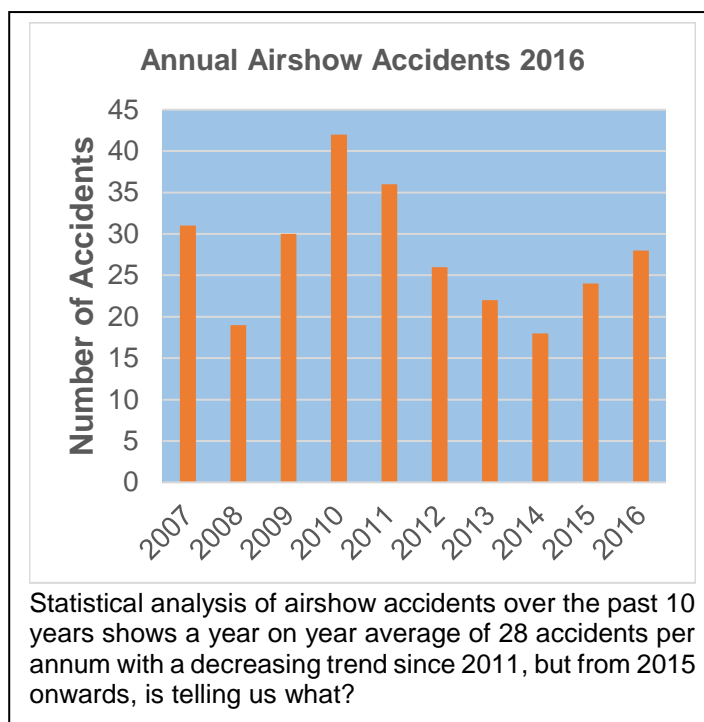
In absolute terms though, from 42 accidents in 2010, to 18 in 2014, the downward trend has now been reversed with 24 accidents during 2015 and 28 in 2016. Where to now? Are we as the regulator and airshow community able to really arrest the decline? From the foregoing, clearly not, but resilience remains the only course of action available. It is pointless to sit back and just accept what the cards have dealt.

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 107 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, our ability to continually make consistently accurate decisions within the hazardous low level display arena, remains questionable.

The accidents in 2016 did not go by without concern from the general public and regulators. With the 2015 Hawker Hunter accident still vividly unforgettable in the publics' minds, particularly in the UK, (with a possible 'fall out' in the USA), any airshow accident or incident received a more than passing glance in media reports.

The hosting of airshows was in some cases questioned by the public still reeling from the carnage of the Shoreham accident. Some of the bizarre accidents that revived the fears of 2015 were the spate of four different aerobatic team accidents in one week. The Swiss *Patrouille Suisse* F-5 midair



and the Russian Air Force's *Russian Knights* Su-27 'technical' problem, marked the third and fourth accidents in the month of June and followed the USN *Blue Angels* F-18 and USAF's F-16 *Thunderbird's* accidents, exactly one week earlier; then in November 2016, another national formation aerobatic team, China's *1<sup>st</sup> August* team suffered the loss of their first woman pilot in a midair collision - improbable odds that defy any statistical explanation. All this despite the fact that all the formation aerobatic teams were highly disciplined, well-regulated, well maintained and well-practiced.

Once again the media question posed was: "What Is Going On With All These Air Show Crashes?" And to end the season off, a part of a Warbird involved in the *Wings Over Dallas Airshow* fell off and impacted a local resident's garden.

In this 2016 report, the official accident investigation reports have not yet been formally published and use was therefore made, where appropriate, of public media channels and eye witness accounts to develop this analysis. 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 trends in airshow safety worldwide.

## 2016 STATISTICAL OVERVIEW

### Casualties

A total of 28 accidents and incidents were recorded which included an unacceptable 17 fatalities in which 12 pilots lost their lives and 8 casualties which included seven spectators and one skydiver. Once again passengers were killed - when will we ever learn that the passenger seat on a low level display or demonstration merely increases the casualty toll in the event of an accident.

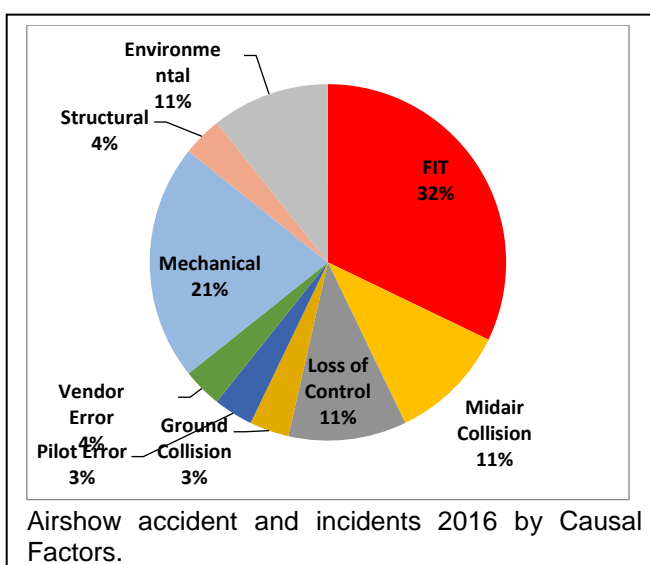
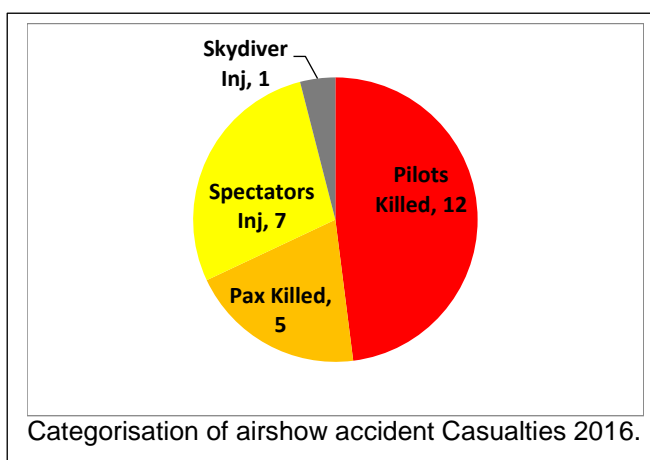
As long as display pilots continue to offer passengers the opportunity to fly with during a display, we will continue to lose additional lives unnecessarily. There can never be a good reason to take a passenger on a low level display.

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 branding at all!

### Causal Factors

Flight-Into-Terrain, in keeping with statistical tradition at 32%, came close to the historical average of 30%. After four years in succession in which mechanical failure was the highest contributor, Machine decreased to 21% and Loss of Control was down to only 11% from the historical average of 17%. Loss-of-Control accidents again resulted from tumbling manoeuvres on the downline; display pilots flying sport aero category aircraft failed to regain control from 'out of control' situations; a concerning trend in which accidents from 'out of control' manoeuvres continues unabated each year.

In many cases, the impact attitude of the aircraft approached the horizontal, implying the height budget for the manoeuvre was inadequate by a small margin only, which indicates that the energy loss is not consistent enough to provide the pilot with an absolute error margin.



There is no doubt that the energy loss during gyroscopic tumbling manoeuvres is not an exact science and that a scientific study into energy loss during tumbling manoeuvres is required to quantify energy management and error budgets for such downline manoeuvres.

A 'quick win' could be for all display pilots that include high energy tumbling manoeuvres in their routine to understand the inconsistent and unpredictable nature of energy loss and to maintain 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 at low heights are not for amateurs!

Mid-air collisions, at 11% approached the historical average of 15%. Full time professional military team accidents, including the *Blue Angels*, *Thunderbirds*, *Russian Knights*, *Patrouille Suisse* and *1<sup>st</sup> August*, raised questions from many different quarters as to what exactly was the problem? It is necessary to note that two of the accidents were attributable to technical malfunctions while the other three were midair collisions.

The risk of Flight-Into-Terrain remains the biggest threat and focus must shift to the mind of the display pilot in understanding tumble aerodynamics, physiological and psychological principles of plan continuation bias, normalisation of deviance and cognitive dissonance, etc. It would be prudent to include such topics for discussion at the annual airshow safety conventions worldwide.

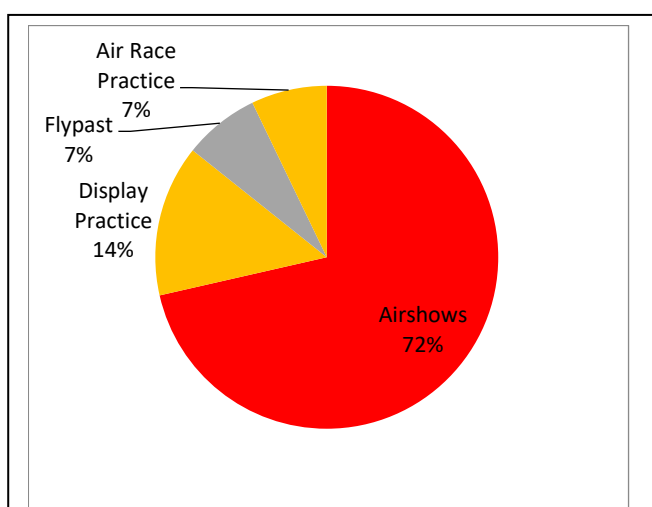
### Event Categorisation

Historically, 62% of accidents and incidents occurred during actual displays versus practice; 2016 saw a slightly higher percentage at 72%. 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.

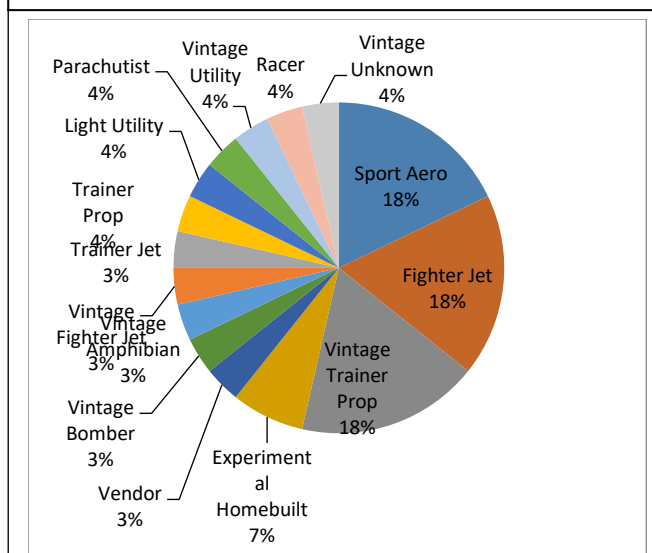
There are often cases in which the conditions during rehearsal are less than ideal and pilots then elect to postpone rehearsals until conditions improve. The problem is that on show day under less than ideal conditions, with the demands from the event organiser and pilot's wanting to meet their fee commitments, 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.

### Accidents by Country

28 accidents in thirteen different countries! The USA, by virtue of its significantly greater number of airshows annually, experienced 11 accidents and incidents followed by China 3, the United Kingdom 3, Germany 2, while Australia, Canada, Mexico, Netherlands, New Zealand, South Africa, South Korea, Russia and Switzerland all suffered one accident each. 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.



Airshow accident/incidents 2016 by Event Category.



Airshow accidents and incidents 2016 by Aircraft Category.

## Aircraft Categories

Bearing in mind the reduced participation of military aircraft and the increased number of vintage aircraft at airshows worldwide, Sport Aero and Experimental/homebuilt aircraft on the display circuit, the aircraft categorization essentially reflected the main participants involved in accidents with Vintage aircraft at 33%, Sport Aero at 18% and Experimental at 7%.

What was of concern was the fact that once again vintage aircraft, as was the case in 2011 through 2015, continued to make up the biggest proportion of aircraft types involved in the accidents. Since there has been a significant increase year on year in vintage aircraft actively participating in airshows, this is more than likely going to remain the trend in the future.

## ACCIDENT/INCIDENT OVERVIEW 2016

### 1. 28 MARCH 2016: NORTH AMERICAN T-6 SNJ HARVARD (WANAKA, NEW ZEALAND)

The pilot and a fee paying passenger were uninjured when a 1943 Harvard that was taking part in the *Warbirds over Wanaka Airshow* 'rides day', skidded off the runway on landing. The aircraft was one of five that make up the *Roaring 40s* aerobatic display team.

It was the second incident involving a Harvard. Prior to the landing accident, a Harvard apparently aborted a take-off with an unspecified mechanical problem. The passenger reported that during their take-off roll "there was a problem and one wing actually clipped the tarmac." The airport was temporarily closed while that aircraft was cleared from the runway.<sup>1</sup>



Reports indicated mechanical problems with the undercarriage which caused the aircraft to veer off the runway before the undercarriage collapsed. (Otago Daily Times)

### 2. 17 APRIL 2016: EXTRA 300-L (COZUMEL, MEXICO)

In what can best be described as bewildering, the accident in which Juan Miguel García Salas was killed at the *Aeroshow in Cozumel*, left many questions unanswered. Determining the cause could prove extremely difficult due to the strange trajectory of the aircraft.

Salas was three minutes into the show and had just recovered from a three-turn downline tumble and was exiting the display box. The aircraft levelled off and commenced a tight right hand level turn to re-enter the display box when half way through the turn, the nose just dropped and the aircraft continued in the turn, killing Salas on impact. The event was immediately cancelled.<sup>2</sup>

### 3. 07 MAY 2016: AIRSHOW VENDOR (PRETORIA, SOUTH AFRICA)

Six people suffered severe burns after a cooking spray bottle exploded at a vendor stand during the *South African Air Force Museum Airshow* held annually at AFS Zwartkop. A medical spokesperson reported that six people had sustained severe burns and were in a serious condition. The injured were stabilised and taken to various hospitals in the area for further medical assistance.<sup>3</sup>

### 4. 14 MAY 2016: WOLFF PITTS S-2SW (GEORGIA, USA)

Greg Connell was performing synchronised aerobatics during the *Good Neighbour Day Airshow* at DeKalb Peachtree Airport in Atlanta as part of a two-ship synchro pair; the other aircraft was a MX2. The two aircraft had performed an opposition pass along the display line at show centre and then each pulled up for a half-Cuban with the aim of crossing again at show centre.

The Pitts' trajectory appeared normal with sufficient height to affect a safe recovery but after the roll to erect on the downline, significant, sharp wing rock was evident prior to impact, first to the left and then to the right at an estimated 80°/sec; the Pitts was under positive control and generating

<sup>1</sup> Mark Price, Otago Daily Times, *Planes in the wars at Wanaka*, 29 March 2016.

<sup>2</sup> Raul Algaza, *Aeroshow pilot dies in freefall crash*, Riviera Maya News, 18 April 2016.

<sup>3</sup> African Pilot Aviation News 19 2016, *Six people treated for burns at SAAF Museum airshow explosion*, 9 May 2016.

controlled nose rate through the top into the down line and appeared to begin levelling off just before impact.<sup>4</sup>

The Pitts impacted the grass infield between runways creating a wreckage debris field about 500 feet in length and skidded onto the tarmac before being engulfed in a fireball as spectators gasped in horror. Firefighters put out the blaze in two minutes but the post-crash fire consumed a majority of the wreckage. The awkward flight axis movement immediately before impact was strange but may prove to be pertinent to causal factors.

## **5. 02 JUNE 2016: BOEING MCDONNELL DOUGLAS F-18, USN *BLUE ANGELS* (TENNESSEE, USA)**

In a bizarre coincidence, a USAF *Thunderbirds* F-16 and a USN *Blue Angels* F-18 crashed on the same day; the notorious Split-S at low-level claimed the life of US Marine pilot, Capt. Jeff Kuss in Lynchburg as the F/A-18 crashed near Nashville.

Although the weather was generally fine with scattered cumulus type clouds drifting across the airfield, it was deemed acceptable for the practice. The synchro-pair, No. 5 and No. 6, took off for the practice, No. 5 going straight into a 'dirty' aileron roll after take-off and then turning left out with the intention of completing a 360° turn to crossover with No.5 who had climbed straight ahead steeply with the intention of performing a Split-S to reverse direction along the runway and cross with No.5 at show centre.

The first 'domino' to fall was the radio call by Kuss to the lead solo, Lt. Chamberlain, asking him if he thought it was possible to complete the high-performance climb with the clouds in his path. Chamberlain apparently responded that, yes, he thought Kuss could make it.

The publicly released JAGMAN report listed 'pilot error' as the primary cause, stating that the aircraft was outside of gate parameters for the Split-S; too low (3,196 feet) and too fast before entering the Split-S after take-off. The manoeuvre was supposed to be initiated at an altitude of no less than 3,500 ft agl and with an optimum airspeed of 125 to 135 knots. The Hornet was at 184 knots and with turn radius a direct function of true airspeed, the result was catastrophic. Although the pilot ejected, the aircraft was out of safe ejection parameters.

Further aggravating the dynamics of the manoeuvre and contrary to standard operating procedures (SOPs), the afterburners remained on during the manoeuvre – the aircraft continued to accelerate rapidly, thereby indirectly increasing the turn radius.

In 2003, a *Thunderbirds* solo ejected from a F-16 1/8ths of a second prior to the aircraft impacting the ground – the accident investigation concluded that an incorrect altimeter setting caused the pilot to commit to the downline of a Split-S too low. A similar accident occurred in 2004 when the *Blue Angels* were training a new No. 6 pilot; the pilot survived, but the aircraft was destroyed.

Despite the fact that previous accidents called for a higher safety altitude for Split-S manoeuvres and that that all pilots MUST make positive confirmation over the radio of their altimeter settings prior to take-off, this type of accident happened again. The report also directed that all manoeuvres and altitudes must be re-assessed against the team's flight demonstration objectives of making impact versus safety measures and buffers.<sup>5</sup>

'Pilot Error' is a finding that will raise questions among those familiar with military precision flight teams famous for their discipline, exacting training and commitment to perfection. But it is here where the community need to understand the issue of the fickleness of judgement in the low level display arena. The definition of 'pilot error' MUST be reviewed to re-define such a decision to 'pilot judgement error', NOT 'pilot error'.

## **6. 02 JUNE 2016: GENERAL DYNAMICS F-16, USAF *THUNDERBIRDS*, (COLORADO, USA)**

The USAF's *Thunderbirds* No.6 pilot, Maj. Alex Turner, was forced to eject from his F-16 after a flyover for the *Air Force Academy's Graduation Ceremony* and was returning to Peterson AFB when it crashed.

According to a report from Air Force investigators, a throttle malfunction was blamed for the jet's crash in that it effectively caused the pilot to accidentally cut the engine while completing landing procedures; the pilot inadvertently rotated the throttle, placing it into an engine cut-off position.<sup>6</sup> Normally, this full rotation could not occur unless a throttle trigger was positively 'pressed'. However,

<sup>4</sup> NTSB Identification: ERA16FA182, Greg Connell Pitts S-2SW, N24CD, 14 May 2016.

<sup>5</sup> United States Department of the Navy, *Command Investigation into the Circumstances Surrounding the Navy Flight Demonstration Squadron Class A Aviation Mishap in Smyrna*, 25 August 2016.

<sup>6</sup> Airshow Stuff, *Air Force Announces Report Findings On 2016 Thunderbird #6 Crash – Pilot Cleared*, 14 December 2016.



the throttle trigger was stuck in the 'pressed' position which allowed Maj. Turner to shut the engine down rather than setting it to idle power as intended.

The problem was traced to the improper installation of a throttle control. Air Force investigators cited lax maintenance practices for the crash and recommended updates to maintenance manuals to prevent similar malfunctions. The investigation also discovered debris accumulation and excessive wear in the throttle trigger assembly. Turner was unable to restart the engine due to his low height and ejected after steering the aircraft toward an empty field.

#### 7. 05 JUNE 2016: DE HAVILLAND DH.82 TIGER MOTH (OXFORDSHIRE, UK)

In an accident remarkably similar to one in 2010 in Germany, around 100 spectators saw the Tiger Moth crash into a parked car after control loss during take-off at the *Air Ambulance Charity Airshow* at Brimpton private airfield, leaving the vehicle owner with serious facial injuries.

After engine faltering during take-off, the aircraft lurched towards the ground and headed towards a row of cars in a field. The crew of two survived with only minor injuries, but an elderly female spectator, was not as lucky. She was rushed to the nearby hospital by air ambulance - the good cause the airshow was raising money for, to be treated for serious facial injuries.<sup>7</sup>

The incident came just weeks after the investigation into the Shoreham Airshow disaster had highlighted several safety failings and which rekindled the raw emotions of airshow accidents in the UK.<sup>8</sup>



The Tiger Moth departed after take-off and veered off to impact a vehicle in the parking lot. (Tadley Fire Station)

#### 8. 09 JUNE 09, 2016: SUKHOI SU-27 RUSSIAN KNIGHTS (MOSCOW, RUSSIA)

One week later, another formation flyover accident. On returning to their home base in Kubinka after a flyover of the nearby Monument to Aviators in Ashukino, a ceremony attended by Russian Deputy Defence Minister and Commander-in-Chief of the Russian Air Force, one of the *Russian Knights'* Su-27 crashed near Muranovo village, killing the leader of the *Russian Knights* aerobatic team, Major Sergey Eremenko.

Major Eremenko reportedly tried to avoid crashing into the village and did not attempt to eject. No additional damage or injuries on the ground was reported. Preliminary analysis suggested the crash was caused by a technical failure.<sup>9</sup>

#### 9. 09 JUNE 2016: NORTHROP F-5E TIGER, PATROUILLE SUISSE (LEEWARDEN, NETHERLANDS)

The fourth formation aerobatic team accident in one week as *Patrouille Suisse*, the Swiss Air Force demonstration squadron, suffered their first accident when two F-5E Tigers collided with one another during the validation flight for the upcoming *Royal Netherlands Air Force Open Days*.<sup>10</sup> No.5 and No.6 were performing synchronised opposition manoeuvres in conjunction with the four-ship formation.

During the join-up with the four-ship, two of the F-5s collided in midair. The No.5 pilot ejected safely but was injured when he crashed through the glass roof of a greenhouse; the aircraft impacted into local



Right hand stabilator reduced to less than half span but still able to land safely after midair collision. (David Cenciotti)

<sup>7</sup> Aviation Safety Network, Occurrence #187883, De Havilland DH.82 Tiger Moth, 05 June 2016.

<sup>8</sup> Steve Robson, Mirror, Brimpton Plane Crash, 5 June 2016.

<sup>9</sup> RT, Fighter Jet Crash: Su-27 pilot killed near Moscow, failed to eject trying to avoid homes, 9 June 2016.

<sup>10</sup> Aviation Safety Network, ASN Wikibase Occurrence # 187994, Northrop F-5E Tiger II, 09 June 2016.

dam, while the other aircraft was able to land without incident despite losing part of its right hand horizontal stabilizer. The Swiss Army cancelled its participation in the airshow.

**10. 17 JULY 2016: NORTH AMERICAN T-28 TROJAN, (ALBERTA, CANADA)**

ICAS member and warbird pilot Bruce Evans, was killed when his T-28 Trojan crashed at the *4 Wing Cold Lake Airshow*. According to reports, the aircraft failed to pull out from a loop; there was a large bang but no explosion or flames; the remainder of the event was cancelled. Announcers and workers at the show kept the crowd calm and eventually directed them out of the area.<sup>1112</sup>

**11. 22 JULY 2016: RUNYAN SKYBOLT 30 (OKLAHOMA, USA)**

ICAS member and airshow performer Randy Harris was involved in a fatal accident while flying his Skybolt biplane in preparation for the *Vance Air Force Base 75<sup>th</sup> Anniversary Open House and Airshow* in Enid.

Harris apparently lost control of the aircraft which impacted the ground in an open, field, killing Harris and a passenger, USAF 1st Lt. Dale Shillington. Both died of injuries before emergency personnel reached the scene of the accident; the airshow proceeded as scheduled.

**12. 25 JULY 2016: DOUGLAS A-26B INVADER (WISCONSIN, USA)**

During the landing run on arrival to participate in the EAA AirVenture 2016 at Whitman Regional Airport, Oshkosh, the nose undercarriage of the vintage Invader collapsed. During the initial approach onto RW27, the nose wheel wouldn't extend correctly, so they performed a go-around.

They then climbed away to consider the best course of action. On return, having reduced fuel, they landed on RW 36 knowing the nose wheel was only partially extended. The nose wheel assembly collapsed and the aircraft slid to a halt on its main wheels and nose before all crew evacuated. Damage was caused to the nose section, propellers and nose undercarriage door.<sup>13</sup>



The engines were shut down on touchdown but the windmilling props still contacted the runway; the aircraft slid to a halt on its main wheels and nose before all crew evacuated safely. (Airshow Stuff)

**13. 31 JULY 2016: MARTIN MARS**

The famous "Hawaii Mars II" water bomber, the only flying example remaining of the type, was one of the main attractions at EAA AirVenture 2016 but did not survive the show unscathed. The aircraft performed in the Monday, Wednesday, and Friday airshows, but suffered a bird strike to one of its four engines on the Friday.

In the ensuing landing on Lake Winnebago, it hit a rock that tore a basketball-sized hole in the flying boat's hull. The damage forced the plane to miss its planned Saturday airshow appearance, but after extensive pumping and some repair work, it was able to fly home a few days later.<sup>14</sup>

**14. 13 AUGUST 2016: VOGT Lo 100 ZWERGRIEHER GLIDER (SIEGEN, GERMANY)**

While landing in relatively windy conditions following a display at the *Eisernhardt Air Festival*, a gust of tailwind caused the glider to overshoot the runway and collide with a one-metre-high steel mast at the airfield perimeter and snap the fuselage in half.

Fortunately, the pilot was not injured and the first responders immediately on the scene, helped the pilot from the glider.<sup>15</sup>



Environmental factors such as weather, continue annually to contribute to airshow accident statistics. (Jurgen Schade)

<sup>11</sup> "Bruce Evans, Alberta Pilot, Killed in Air Show Crash", Huffpost Alberta, 23 July 2016.

<sup>12</sup> NTSB Identification: ANC16WA044, North American T-28B, C-GKKD, 17 July 2016.

<sup>13</sup> Aviation Safety Network, ASN Wikibase Occurrence # 188878, Douglas Invader A-26, N99420, 25 July 2016.

<sup>14</sup> Airshow Stuff, *Martin Mars Stars In AirVenture Lineup, Recovers From Damage*, 31 July 2016.

<sup>15</sup> Aviation Safety Network, ASN Wikibase Occurrence # 189286, Vogt Lo-100 ZwerGreiherr, 13 August 2016.



**15. 14 AUGUST 2016: DRUINE D.31 TURBULENT (KENT, UK)**

A Druine D.31 Turbulent, one of the five-ship *Turbulent Display Team*, ditched in the sea adjacent to the beach during the *Herne Bay AirShow* after the Turbulent suffered a loss of power, declared a Mayday and continued with a forced landing a few metres off shore.

As the wheels dug into the water, the plane flipped over with the open-cockpit coming down in shallow water, trapping the submerged pilot in the open cockpit. Due to the quick actions of the onlookers, the pilot was relatively unharmed; the rescuers of the pilot were described as "heroes" for their quick-thinking and bravery. If the onlookers hadn't flipped the 350 lbs aircraft over and removed the pilot quickly, it could have been a lot worse.<sup>16</sup>

**16. 20 AUGUST 2016: HAWKER SEA HURRICANE (BEDFORD, UK)**

On completion of the display at the Shuttleworth *Flying Proms*, in strong gusty wind conditions, flaring too low for the three-point attitude, the tailwheel impacted the ground first at high energy and broke off. The Hurricane continued the remainder of the landing run dragging the tailwheelless fuselage. Damage to the aircraft was relatively minor.<sup>17</sup>

**17. 20 AUGUST 2016: DEWOITINE D.26 (WITTINGSBURG, SWITZERLAND)**

A Dewoitine D.26, HB-RAG, overran the runway on landing and flipped over onto its back during the *Wittingsburg Airshow*. The pilot emerged unharmed.<sup>18</sup>

**18. 27 AUGUST 2016: BOEING STEARMAN (OREGON, USA)**

World renowned Alaskan aerobatic pilot, Marcus Paine, was killed when his Stearman crashed during the *Airshow of the Cascades* at the Madras Municipal Airport. Witnesses stated that the vintage Stearman impacted the ground recovering from a loop, killing Paine on impact.

Footage from the scene showed a plume of black smoke rising from the crash site as firefighters worked to put out a fire that broke out but was quickly extinguished. An air ambulance landed at the airport about fifteen minutes after the crash and the airshow was cancelled.<sup>19</sup>

**19. 27 AUGUST 2016: EXTREMEAIR XA-42 SBACH 342 (GANSU, CHINA)**

Crowned champion at the Intermediate World Aerobatic Championships at Mossel Bay, South Africa in 2014, *Red Bull* and *Firestars* aerobatic pilot, Michel Leusch, was killed during the *1st Silk Road International General Aviation Convention* in the city of Zhangye when the Sbach 342 suddenly departed the recovery pull out from downline tumble manoeuvres. The Sbach impacted 100 metres away from the Danxia airport runway and no other injuries were reported. Leusch was part of a group of South African display pilots participating in airshows in China.<sup>20</sup>



Spectators quickly rushed to the pilot's aid and erected the aircraft, thereby saving his life. (Bruno Tilley)



With insufficient height to effect a safe recovery, the Stearman impacted the runway at Madras Municipal Airport. (Jefferson County Sheriff's Office)

<sup>16</sup> Aviation Safety Network, ASN Wikibase Occurrence # 189271, *Druine D.31 Turbulent G-ARNZ*, 14 August 2016.

<sup>17</sup> Forum.keypublishing.com, *Shuttleworth Sea Hurricane Incident*, 21 August 2016.

<sup>18</sup> [www.worldwarbirdsnew.com](http://www.worldwarbirdsnew.com), *Dewoitine D.26 Accident in Switzerland*, 21 August 2016, downloaded 25 December 2016.

<sup>19</sup> J. Dowling, KOIN 6, *Pilot dies in Madras air show plane crash*, 27 August 2016

<sup>20</sup> Aviation Safety Network, ASN Wikibase Occurrence # 189592, *XtremeAir XA-42 Sbach 342*, 27 August 2016.





**20. 10 SEPTEMBER 2016: ULTRALIGHTS (SAXONY, GERMANY)**

A glider pilot and his daughter were killed when their glider collided with an ultralight on approach to the *Flugplatzfest Grossrückerswalde 2016 Airshow* in Saxony. The glider crashed to the ground, killing its two occupants, while the ultralight aircraft was able to land at a nearby airport safely without any injuries.<sup>21</sup>

**21. 15 SEPTEMBER 2016: SHIJIAZHUANG LE-500 LITTLE EAGLE (HEBEI PROVINCE CHINA)**

For the second time in two months, a Chinese airshow was shocked by an airshow accident, this time of the locally manufactured, Shijiazhuang LE-500 Little Eagle, a reversed engineering EADS Socata crashed during a demonstration flight at the *Shijiazhuang General*

*Aviation Exhibition*, near Luan Cheng GA Airport, killing the pilot and all three passengers.<sup>22</sup>

The flight was a demonstration flight that had remained in the pattern at the airport and had been airborne for about ten minutes when rolling out from a level left hand turn, the pilot radioed that there was a technical problem.<sup>23</sup> The aircraft was seen to start descending and turning right, then departed to the right and impacted the approach end of runway 18 and was destroyed in a post-crash fire. There was no collateral damage.

**22. 16 SEPTEMBER 2016: DE HAVILLAND VAMPIRE T.MK 5 (NEVADA, USA)**

A Vampire participating in the *Jet Class Gold Race* at the *National Championship Air Races* in Reno made a forced-landing in scrubland following a thrust loss due to a bird strike. After 3.5 laps, the pilot heard a loud bang followed by wind noise within the cockpit. He immediately aborted the race, pitched up and converted airspeed into height.

Having assessed all primary flight controls, trim and controllability and noting no anomalies other than a crack in the right side of the canopy, the pilot attempted two separate engine restarts but without success.

Unable to reach runway 14 or runway 8, he elected to land in the open desert north of the airport and initiated an off-field landing with the undercarriage and flaps retracted. As the aircraft descended through 80 ft agl, he turned off the fuel and all switches. Sadly, the Vampire sustained substantial damage but portions of plexi-glass from the canopy structure were located about 1.6 miles southwest of the accident site.<sup>24</sup>

**23. 21 SEPTEMBER 2016: REBERRY 3M1C1R "HOT STUFF" 1F-1 RACER (NEVADA, USA)**

In what must be described as the miracle of 2016 Airshows and Air Races, media reported the accident as: "Stunt pilot is nearly decapitated on the runway as the wing of a plane taking off slices through his cockpit roof". A bit of an understatement as US race pilot Thom Richard was lucky not to have lost his head. In a lengthy Facebook post Richard detailed the entire incident.

On the runway preparing to take off in the *Gold Formula One* event at the *Reno National Championship Air Race* when suddenly his engine started to splutter and he was forced to abort the take-off and signalled to the marshals he was unable to fly. Yet the message did not get through to three aircraft lined up behind him, waiting to take-off for the race.

In his words: "About 20 seconds before the green flag drop, the engine was not running well enough for flight, never mind racing". Shutting down the engine, he then received a signal from the flagman and opened the canopy to show he was out of the race. Richard said: "I felt confident that the communications had reached the appropriate people and waited for personnel to push me off the runway when all hell broke loose".

<sup>21</sup> RT, *Midair collision during German air show leaves 2 dead*, 10 September 2016.

<sup>22</sup> Aviation Safety Network: ASN Wikibase Occurrence # 190074, *Shijiazhuang LE-500 Little Eagle*, 15 September 2016.

<sup>23</sup> NTSB Identification: WPR16WA186, *Little Eagle LE500*, 15 September 2016.

<sup>24</sup> NTSB Identification: WPR16LA181, *De Havilland DH115 Vampire*, N4861K 16 September 2016.



© Thom Richard/YouTube

Race pilot Thom Richard was stranded due to engine problems as another aircraft raced towards him.



The next aircraft taking off struck his aircraft with a "violent" impact, hitting his hand at 60mph.



The left wing leading edge hit his right hand holding up the canopy.

"However, much to my surprise, I saw the flagman run out onto the runway waving his hands over his head as if something was wrong. All I could do at that point was hope the number seven (centre) aircraft would clear me on the centerline to my right."

Fortunately, it did, apart from striking his hand, but only by the narrowest of margins. Richard's plane 'Hot Stuff', however, was not so lucky and suffered severe damage. The propeller sliced three evenly spaced gashes about mid span into the right wing, about a foot apart. The impact spun his aircraft around through 180°, "like a teacup ride at warp eight", he said.

The other aircraft came to rest several hundred feet in front of me with a folded gear, damaged wing and sheared propeller facing the other way as well. "That the other pilot received no injuries either, was a miracle," added Richard.

Reno EMS quickly patched Richard up with a splint and had him walking back to his pit in no time. "Another four feet to the left and I would have been minced meat. Literally dodging a bullet. A busted up hand is a small price to pay. I'll take it. It'll heal. I've used up another of my nine lives, but why would you have nine unless you plan to use them? We live, learn and race on".<sup>25</sup>

#### **24. 18 SEPTEMBER 2016: PITTS S-2B (SOUTH CHUNGCHONG PROVINCE, SOUTH KOREA)**

An air force veteran pilot Maj. Ahn, died when his Pitts S-2 crashed into the runway at the *Taeon Airshow* during his display. Entering the vertical with a one turn roll, pushing over at the apex and transitioning into a two-and-a-half turn left spin, the aircraft recovered from the spin but with insufficient height to effect the recovery pull-out safely, the aircraft impacted on the airfield.

Apparently no application had been filed with the regional aviation office for an aerobatic display which was required at least one week before the event. "We did not receive any application for the aerobatics flight, and this is in violation of the Aviation Law," an official from the Seoul Regional Office of Aviation said.<sup>26</sup>

#### **25. 31 OCTOBER 2016: UNKNOWN AIRCRAFT (TEXAS, USA)**

A large metal component, possibly an undercarriage door, detached itself from a

supposedly 'unknown' aircraft participating in the *Wings Over Dallas Airshow* and fell into the backyard of a residential home one mile north of the Dallas Executive Airport. The show commemorated the 75<sup>th</sup> Anniversary of Pearl Harbor and featured "TORA! TORA! TORA!" a re-creation of the surprise attack on Pearl Harbor using World War II-era aircraft and pyrotechnics.

When the undercarriage was lowered, it sheared a pin holding the door, which came loose and detached. The flailing aluminium piece, approximately 3 foot by 2 feet, weighed approximately 10 pounds.

<sup>25</sup> Mark Molley, The Telegraph, *Heart-stopping moment pilot has incredible near miss on runway*, 21 September 2016.

<sup>26</sup> Aviation Safety Network: ASN Wikibase Occurrence # 190337, *Pitts S-2B. HL1161*, 24 September 2016.

A neighbour said: "I noticed a shadow going across my lawn and I thought to myself, that's a big bird. I saw this huge piece of metal fall from the sky and land in my neighbour's yard, fortunately, without causing any damage" said the neighbour. "When I looked, it had had oil over it and I could tell it was a piece of an airplane that had just flown over, the piece could've easily fallen on my home".

Some homeowners wanted the city to re-evaluate plans about bringing the show back next year. "I don't think I'm in support of it, not after a huge piece fell next door to my house, it's dangerous. Every person on this street has kids and they're always playing outside", he said.<sup>27</sup>

## **26. 12 NOVEMBER 2016: CHENGDU J-10 (HEBEI PROVINCE, CHINA)**

The first woman pilot of the People's Liberation Army Air Force's *August 1st* formation aerobatic team, Maj. Yu Xu, was killed following a midair collision during a training mission; she was one of the first female military pilots in the country.

Details of the accident are scarce, but reports indicated that there was a mid-air collision between at least two of the team's J-10 fighters and that following ejection, Yu may have been struck by another aircraft after ejecting from her own. The other pilot ejected safely.<sup>28</sup>

## **27. 27 NOVEMBER 2016: ESQUAL HOMEBUILT (WANGARATTA, AUSTRALIA)**

*Wangaratta Aero Club's Open Day* was spoilt by the crash of the Esqual homebuilt high performance ultralight aircraft following engine failure after lift-off.

The left wing clipped the ground in the forced landing, swinging the aircraft through 180° before it burst into flames. Both the pilot, John Spronken and the passenger were fortunately able to egress without any injuries. The aircraft was totally destroyed by the fire.<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 were not 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.

Are we doing enough worldwide to reduce the number of airshow accidents/incidents? 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.

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>27</sup> UPI, *Dallas air show plane part falls in homeowner's yard*, 31 October 2016.

<sup>28</sup> Brad Lendon, CNN, *Horrific Crash Kills Yu Xu, 1st Woman to Fly China's J-10 Fighter*, 14 November 2016.

<sup>29</sup> Geelong Advertiser, *Two men escape light plane crash at Wangaratta Airport*, 28 November 2016.