AIRCRAFT ACCIDENT SHORT REPORT

CA18/2/3/9734: ZU-FYZ, Aeroprakt A-22LS Loss of control due to wind shear.

Date and time	:	24 September 2018 0630Z
Location	:	Mountain Sanctuary Park Airfield, North West Province
Aircraft registration	:	ZU-FYZ
Aircraft manufacturer and model	:	Aeroprakt A-22LS Foxbat
Last Point of departure	:	Mountain Sanctuary Park Private Airfield, North West Province
Next point of intended landing	:	Mountain Sanctuary Park Private Airfield, North West Province
Location of incident site with reference to easily defined geographical points (GPS readings if possible)	:	S25°49'30.0" E27°28'28.8" at an elevation of 4500 ft
Meteorological Information	:	Surface wind: 050°/3kt, Temperature: 23°C, Dew Point: 07°C, Visibility: 10km, QNH: 884hPa
Type of operation	:	Private (Part 94)
Persons on board	:	1 + 1
Injuries	:	Pilot sustained serious injuries, passenger sustained minor injuries
Damage to aircraft	:	Substantial damage

All times given in this report is Co-ordinated Universal Time (UTC) and will be denoted by (Z). South African Standard Time is UTC plus 2 hours.

Purpose of the Investigation:

In terms of Regulation 12.03.1 of the Civil Aviation Regulations (2011) this report was compiled in the interest of the promotion of aviation safety and the reduction of the risk of aviation accidents or incidents and ***not to apportion blame or liability.***

Disclaimer:

This report is produced without prejudice to the rights of the CAA, which are reserved

Figure 1: Shows a similar aircraft type (Aeroprakt A-22LS Foxbat)
(Source: http://aeropraktusa.com/)

1. SYNOPSIS

1.1 On 24 September 2018 at approximately 0530Z the pilot and passenger took off from Mountain Sanctuary Park Private Airfield on a local flight in the area and intended to land back at the same airfield.

1.2 On the final approach the pilot noticed a few dust devils (whirlwinds) surrounding the airfield.

1.3 As the aircraft approached the airfield, the pilot found extreme difficulty in controlling the aircraft on the approach path due to the dust devils. Before touchdown, the dust devils caused the aircraft to climb approximately 10 meters. The aircraft eventually touched down and veered off the runway to the left. The right wing dropped and the nose of the aircraft hit a tree, causing substantial damage to the aircraft.

1.4 The pilot sustained serious injuries and the passenger sustained minor injuries.

1.5 The investigation determined that the accident was a result of the loss of directional control on landing caused by dust devils/whirlwind.

2 FACTUAL INFORMATION

2.1. HISTORY OF FLIGHT

2.1.1 On Monday 24 September 2018 at 0530Z, the pilot accompanied by a passenger took off from Mountain Sanctuary Park Private Airfield for a scenic flight around the Mountain Sanctuary Park area. The aircraft had 90 liters of fuel on board. The aircraft departed the airfield in a Southerly direction and climbed to 650ft AGL cruising at 50kts.

2.1.2 The climb and cruise phases were uneventful. The pilot concluded the flight and approached the same departed airfield for a landing. According to the pilot, all the parameters during the flight were within limits.

2.1.3 The aircraft approached the runway at 53 kts. The pilot stated he experienced a crosswind at +/- 5kts and a few dust devils surrounding the airfield. As the aircraft approached the runway, it was configured to a full flair position as the main landing gear touched down. At this point the aircraft unexpectedly experienced a dust devil. The pilot stated that the aircraft lifted 10 meters off the ground, he then applied power to avoid a stall or bounce. The pilot decided to continue with the landing as he still had +/- 300 meters available to complete the landing.

2.1.4 The dust devils made the landing difficult as the aircraft's tail kicked out to the left and the right wing dropped. The pilot attempted to correct this but the left wing hit a tree, which spun the nose into the ground 6 meters away from the runway.

2.1.5 The pilot sustained serious injuries, the passenger sustained minor injuries and the aircraft sustained substantial damage.

Figure 2: shows the aircraft as it came to rest at the accident site.

2.1.6 The accident occurred during daylight conditions at a geographical position that was determined to be S25°49'30.0" E27°28'28.8" at an elevation of 4500 ft.

2.1.7 Figure 3 below shows the Google Earth image of the airfield and the wreckage location.

Figure 3: Runway at Mountain Sanctuary Park Private Airfield.
(Source: Google Earth)

2.1.8 The aircraft was recovered to the owner's hangar at the Mountain Sanctuary Park Private Airfield.

2.2 INFORMATION DESCRIBING A DUST DEVIL

2.2.1 DUST DEVILS/WHIRLWIND

3.1 Dust devils/whirlwinds are low pressure, warm-core vortices with typical surface diameters between 1 and 50 m. Since they receive their vorticity from local wind shears (microbursts) that can be either due to the convective circulation itself or due to larger-scale phenomena, they rotate either cyclonically or anti-cyclonically with equal probability. Near the surface, the warmest air parcels are spiralling in toward the moving dust devil while they absorb heat from the surface. Figure 6 illustrates a basic explanation of this.

(Source: https://journals.ametsoc.org/doi/full/10.1175/1520-0469%281998%29055%3C3244%3AASTTFD%3E2.0.CO%3B2)

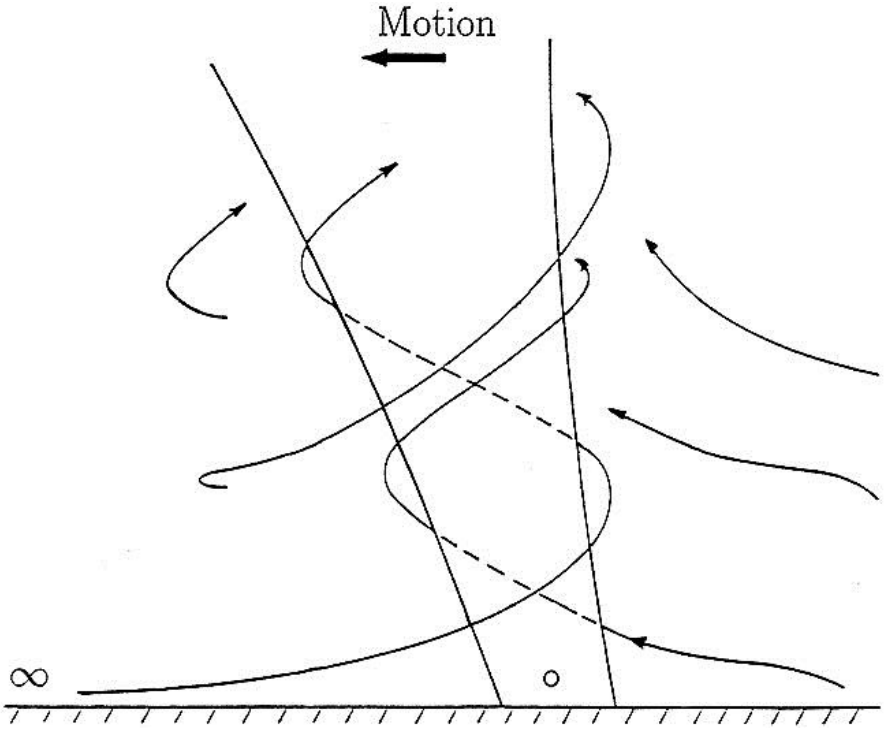

Figure 6: An illustration of a dust devil and how it's formed.
(Source: Reference No. 2)

3.2 Dust devils typically form when hot air rising from the surface meets cooler, low pressure air around it. As the hot air continues to rise, it forms a vortex, pulling in more hot air until a tall spinning column is formed. Eventually the cooler air overcomes the heat, causing the dust devil to collapse. Figure 7 illustrates how a dust devil is formed. (Source: https://www.thenational.ae/uae/environment/uae-weather-what-is-a-dust-devil-and-how-is-it-caused-1.621561).

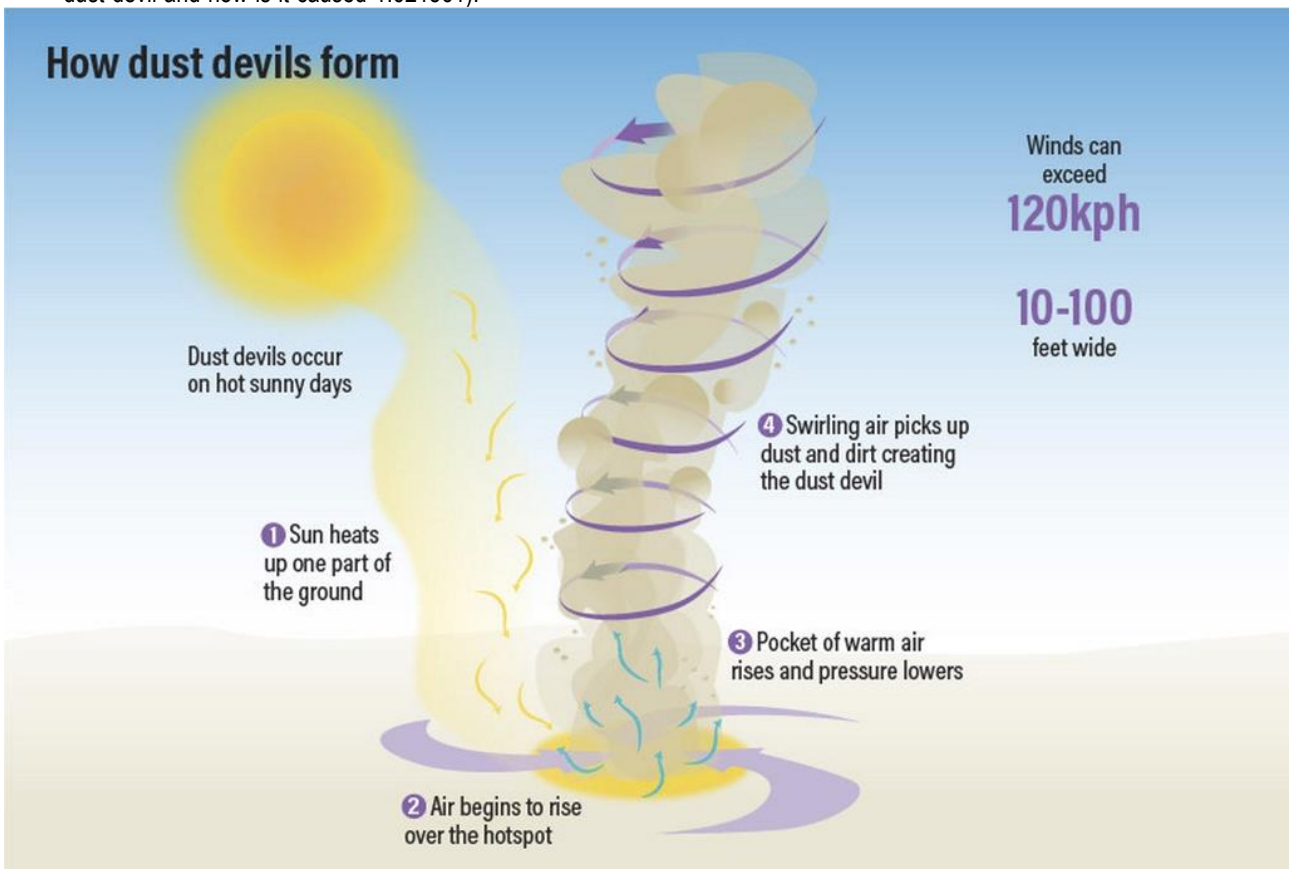

Figure 7: A sketch of a dust devil and how it is formed.

2.2.2 DUST DEVILS IN AVIATION ACCIDENTS AND INCIDENTS (Source: https://commons.erau.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=1000&context=pr-honors-coa)

A study was conducted in 2015 analysing the involvement of dust devils (ambiguous weather phenomenon) in aviation accidents and incidents through the ASRS (Aviation Safety Reporting System), NTSB (National Transportation Safety Board) and the ANS (Aviation Safety Network). 154 cases were reported, mostly with aircraft between 1500 and 3500 pounds. Each case had its own unique details and qualities of dust devils but a number of them created common threads or patterns in terms of what happened to the aircraft while encountering a dust devil. One common thread was that the aircraft experienced turning tendencies and altitude deviations that the PICs believed were ***out of their control*** even with full input of flight controls and power.

Another pattern is that nearly every encounter involved the aircraft in the takeoff/climb or approach/landing phase. In some instances, what the pilots experienced was characteristic of microbursts or strong down draughts. Of the 154 reports, 89 were incidents, 69, accidents, and only 6, fatal (ASN, ASRS, NTSB). Most of the accidents were labelled as such due to substantial damage to the aircraft. The incidents were labelled as such because of the items excluded in the definition of "substantial damage," such as landing gear or ground damage due to prop strikes. The few fatal accidents often involved single pilots who either were inexperienced and did not utilize proper judgment to make the safest decisions or were unfortunate enough to become victims of mechanical or structural defects that escalated after encountering a dust devil. Most of the PICs were either Private Pilot or Commercial Pilot certified and/or Instrument rated, with only 11 of the reports involving student pilots. And finally, in terms of pilot experience, more than half of the reports involved those with over 1,000 hours, some even having close to 30,000 hours.

2.2.3 HOW TO COPE WITH DUST DEVILS (WHIRLWIND) PHENOMENA (Source: https://www.faasafety.gov/files/gslac/library/documents/2011/Aug/56407/FAA%20P-8740-40%20WindShear%5Bhi-res%5D%20branded.pdf)

The South African weather service stated that they cannot forecast nor confirm the occurrence of dust devils as they occur at a very micro scale. Dust devils normally occur on a warm/hot, calm, dry day when a piece of ground heats up faster than the ground surrounding it.

The best way a pilot can prevent a hazardous encounter with wind shear/dust devils is by:

- knowing the wind shear/ dust devil is there;
- knowing the magnitude of the change;
- being prepared to correct or go around immediately.

3 FINDINGS

3.3 The pilot was issued with a national pilot licence on 22 April 1998 with an expiry date of 02 December 2018 and the aircraft type was endorsed on it. He was also issued with a class 4 medical certificate on 16 November 2017 with an expiry date of on 30 November 2019.

3.4 The pilot had a total of 239,0 flying hours of which 220,3 hours were on type.

3.5 The pilot was seriously injured from the accident sequence and was taken to hospital. The injuries sustained were mostly to the lower back and chest area. He has made a full recovery.

3.6 The aircraft was properly maintained and had an Authority to Fly, which was issued on 21 November 2017, with expiry date of 09 November 2019.

3.7 The aircraft's last annual inspection and service was conducted at 222,10 hours on 10 November 2017 by an approved person. Total airframe hours at the time of the accident was 237,6 hours. The aircraft flew a total of 15.5 hours since the last annual inspection was done.

3.8 Certificate of release to service was on 10 November 2017 by an approved person.

3.9 The weather report was requested for the accident that occurred at Mountain Sanctuary Park (Buffelspoort) in the Rustenburg area, approximately 50km form Lanseria International Airport. The weather was reported as follows: wind direction 050 degrees; wind speed: 03 knots; Temperature: 23˚C; Dew Point - 07˚C and a QNH – 884hPa (estimated using the station level pressure)

3.10 It is most likely that as the aircraft approached the airfield, it experienced a whirlwind condition disrupting its aerodynamic control. The pilot attempted to correct for the loss of aerodynamic control due to the random nature of this phenomenon. The disrupted concentration levels of the pilot on the approach segment allowed the aircraft to hit a tree and dive into the ground.

4 PROBABLE CAUSE/CONTRIBUTING FACTOR

The pilot lost directional control of the aircraft due to dust devil conditions during landing at the airfield.

5 REFERENCES USED ON THE REPORT

5.1 https://journals.ametsoc.org/doi/full/10.1175/1520-0469%281998%29055%3C3244%3AASTTFD%3E2.0.CO%3B2

5.2 https://journals.ametsoc.org/na101/home/literatum/publisher/ams/journals/content/atsc/1998/15200469-55.21/1520-0469%281998%29055%3C3244%3Aasttfd%3E2.0.co%3B2/production/images/large/i1520-0469-55-21-3244-f01.jpeg

5.3 https://www.thenational.ae/uae/environment/uae-weather-what-is-a-dust-devil-and-how-is-it-caused-1.621561

5.4 https://www.thenational.ae/image/policy:1.621657:1503328874/.jpg?f=default&q=1.0&w=1024&pfqw=87559fa

5.5 https://commons.erau.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=1000&context=pr-honors-coa

5.6 https://www.faasafety.gov/files/gslac/library/documents/2011/Aug/56407/FAA%20P-8740-40%20WindShear%5Bhi-res%5D%20branded.pdf

6 SAFETY MESSAGE

6.1 Dust devils can be insidious and nearly impossible to overcome. Avoid flying into or near one at all times if possible, especially aircraft that are small, light or underpowered. If one does encounter a dust devil or whirlwind, the best action to take is to maintain as much control of the aircraft as possible by being proactive on the flight controls and utilizing the maximum performance capabilities of the aircraft, including power, and if necessary, crash under control.

This Report is issued by:

Accident and Incident Investigation Division
South African Civil Aviation Authority
Republic of South Africa