REPUBLIC OF NAMIBIA

MINISTRY OF WORKS AND TRANSPORT

DIRECTORATE OF AIRCRAFT ACCIDENT INVESTIGATION

CIVIL AIRCRAFT ACCIDENT REPORT

ACCID/012916/02-02

OPERATION	**:**	License Renewal Flight
AIRCRAFT	**:**	V5-MJW
LOCATION	**:**	Hosea Kutako Airport **(** 313m NNE Of the runway threshold**).**
DATE	**:**	29 JAN 2016

FOREWORD

This report presents the factual information, data analysis, conclusions, and safety recommendations reached during the investigation. The purpose of the investigation was to establish the circumstances surrounding this accident.

In accordance with the provisions of Annex 13 to the convention on International Civil Aviation Organization and Civil Aviation Act (Act No 6 of 2016), the accident's analysis, conclusions, and safety recommendations contained therein are intended neither to apportion blame nor to single out any individual or group of individuals. The main objective was to identify the systematic deficiencies and draw lessons, from the occurrence, which might help to prevent accidents and incidents in the future. To this end, many a time, the reader may be interested in whether or not an issue was a direct cause of the accident (that has already taken place), whereas the investigator is mainly concerned with the prevention of future accidents/incidents.

As a result, usage of this report for any purpose other than (the latter and spirit of Annex 13 and other relevant statutes) prevention of similar occurrences in the future might lead to erroneous interpretations and applications.

ABBREVIATION

AD	-	Airworthiness Directive
AIP	-	Aeronautical Information Publication
AMO		Aircraft Maintenance Organization
ATC	-	Air Traffic Controller
ATPL	-	Airline Transport Pilot License
C of A	-	Certificate of Airworthiness
C of R	-	Certificate of Registration
CPL	-	Commercial Pilot License
CRM	-	Crew Resources Management
CVR	-	Cockpit Voice Recorder
DCA	-	Directorate of Civil Aviation (NCAA)
DE	-	Designated Examiner
ETA	-	Estimated Time of Arrival
FDR	-	Flight Data Recorder
FYWE	-	Eros airport
ICAO	-	International Civil Aviation Organization
ILS	-	Instrument Landing System
IR	-	Instrument Ratings
MPI	-	Mandatory Periodic Inspection
NM	-	Nautical Miles
NNE	-	North North East
PIC	-	Pilot in Command
SB	-	Service Bulletins
SEAMS -	-	Smart Electronic Aviation Management Systems
SOPs	-	Standard Operating Procedures
UTC	-	Universal Time Co-ordinate
VOR	-	VHF Omni Directional Radio Range

TABLE OF CONTENTS **PAGE**

Ministry of Works and Transport | **ACCID/012916/02-02**

DIRECTORATE OF AIRCRAFT ACCIDENT INVESTIGATIONS
ACCIDENT REPORT – EXECUTIVE SUMMARY

Aircraft Registration	V5-MJW	**Date of Accident**	29 JAN 2016	**Time of Accident**	08:10 UTC
Type of Aircraft	CESSNA 425		**Type of Operation**	License Renewal flight	
Pilot-In-Command License Type	Air Transport Pilot License	**Age**	41	**License Valid**	Yes
Pilot-In-Command Flying Experience	Total Flying Hours	11 686.56 as at (24th August 2015)		Hours on Type	Information unavailable

Last point of departure	Eros airport (FYWE)
Next point of intended landing	Eros airport (FYWE)

Location of the accident site with reference to easily defined geographical points (GPS readings if possible)

Approx. 313m NNE of the runway threshold (runway 26) S 22 46'83.51" E 17 48'87.05

Meteorological Information	Wind Direction: 140 degrees, Wind speed: 08knots, Visibility: <10 Km, Temperature: 26°C Cloud cover: FEW 040, Cloud base: Nil, Dew point: 13 , QNH 1025				
Number of people on board	3	**No. of people injured**	0	**No. of people killed**	3

Synopsis

On 29 January 2016, a Cessna 425 Reg. V5-MJW, crashed while conducting instrument license renewal flight under visual meteorological flight conditions at the Hosea Kutako International Airport (FYWH) Namibia. All three crewmembers were fatally injured. The aircraft was destroyed by high impact forces and consumed by post impact fire. The Air Traffic Services reported the accident to the Directorate of Aircraft Accident Investigation telephonically. The investigation was organized, conducted and released by the Directorate of Aircraft Accident Investigation on 12/04/2017.

National Transportation Safety Board (NTSB) accredited representative from State of manufacturer and Transportation Safety Board of Canada (TSB) the state of engine manufacturer were contacted. An advisor from the State of Engine manufacture participated in the engine teardown in Namibia.

The weather was fine with unrestricted visibility.

Unless otherwise indicated, recommendations in this report were addressed to the Namibian Civil Aviation Authority having responsibility for the matters with which the recommendations was concerned. It is for that authority to decide what action is taken.

The pilots licenses were all endorsed with the type of aircraft.

The Aircraft Maintenance Organization (AMO) that certified the last MPI on the aircraft prior to the accident was in possession of a valid AMO Approval No. 074. The annual inspection was certified on 19/11/2015 at 10095.7 airframe hours. Certificate of Release to Service issued and was valid until 19/11/2016.
No Airworthiness Directives (ADs) or Service Bulletins were performed during the last annual inspection.

Probable Cause

The aircraft stalled at low altitude and consequently impacted the terrain.

Contributing Factors

1. Loss of control of the aircraft. (LOC-I)
2. Non-adherence of go-around procedures as set on the AIP.
3. Normalization of deviation - where non-standard go-around procedures are executed.

AIRCRAFT ACCIDENT REPORT

Name of Owner/Operator	**:**	Eros Air
Manufacturer	**:**	Textron Aviation (Cessna)
Model	**:**	Cessna 425 **(**1981)
Nationality	**:**	Namibian
Registration Marks	**:**	V5-MJW
Place	**:**	Hosea Kutako Airport (Oupembemewa farm)
Date	**:**	29 January 2016
Time	**:**	08:10 UTC

All times given in this report is Co-ordinated Universal Time (UTC). Namibia +2 hours

Disclaimer:

This report is given without prejudice to the rights of the Directorate of Aircraft Accident Investigations, which are reserved.

Purpose of the Investigation:

In terms of the Civil Aviation Act (Act No 6 of 2016) and ICAO Annex 13, 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 establish legal liability****.*

This report contains fact relating to aircraft accidents or incidents, which have been determined at the time of issue. The report may therefore be revised should new and substantive facts be made available to the investigator(s).

1 FACTUAL INFORMATION

1.1 History of Flight

1.1.1 On 29 January 2016, at 08:10 a Cessna 425 Conquest, which was privately operated, crashed approx. 300 meters NNE of threshold Runway 26.

1.1.2 According to the flight plan filled on the 28th January 2016, the flight was scheduled for a renewal of CPL and IR ratings for the two pilots by a Designated Examiner (DE). Departure time was scheduled at 07:45 at a cruising altitude of FL100 for Hosea Kutako Airport.

1.1.3 The pilots requested a procedure for an Instrument Landing System (ILS) approach. The Air Traffic Controller (ATC) cleared them for the procedure for runway 26 ILS approach with QNH 1024. They were also asked to report when at nine miles-inbound.

1.1.4 At around nine miles they reported their location and were instructed to continue the approach along the glide slope. The DE requested a VOR approach for their next approach and an early right hand turnout that was approved by ATC who also required them to report when going around. The ATC stated that he saw them at around 4nm on final approach. He then stated that he looked away for a moment after which he heard a slight bang, then saw a ball of flames at about 300 meters north of threshold runway 26. He called out to the aircraft three times whilst looking out for it when he finally concluded that it could have been V5-MJW that had crashed. The ATC pressed a crash alarm after a moment when it did not go off, the controller then called the fire station and alerted them of the occurrence.

1.1.5 The Airport's Fire and Rescue team after receiving the initial notification from the ATC took around 10

minutes to reach the site, by that time fire had engulfed the plane and its occupants. The team took 3-4 minutes to extinguish the fire.

1.1.6 The weather was reported as fine with winds about 140^0 at 08 kts with scattered clouds at 4000ft and unrestricted visibility.

1.2 Injuries to Persons

Injuries	Pilot	Crew	Pass.	Other
Fatal	3	0	0	0
Serious	0	0	0	0
Minor	0	0	0	0
None	0	0	0	0

1.3 Damage to Aircraft

1.3.1 The aircraft was destroyed on impact and consumed by post impact fire.

1.4 Other Damage

1.4.1 Surrounding vegetation was scorched by post –impact fire.

1.5 Personnel Information

Pilot 1 DE (Designated Examiner)

Nationality		Namibian			
Licence No	TA 0768	**Gender**	Male	**Age**	41
Licence valid		**Yes**	Type Endorsed	Yes	
Ratings		Single and Multi-engine			
Medical Expiry Date		20 February 2016			
Restrictions		None			
Previous Accidents		Unknown			

The 41 year-old pilot held an Air Transport Pilot's License (ATPL) No.TA 0768. The license included the ratings for A320, EMB 135/145, F406, B190, C208 and C425 (PIC and IR). The pilot's instructors license was valid till 01/02/2016 and DE license till August 2016.

The class 1 medical certificate was issued on 20/01/2015 and valid to 31/01/2016 with no restrictions.

According to the Civil Aviation Authority's records, the C425 ratings were valid only until 20/07/2015. The records indicate that the pilot's last flight as a Pilot/PIC on a Cessna 425 was on the 13 January 2015 on which 1.0 hour was recorded as PIC.

On the 04 December 2015, the pilot (DE) applied to the authority for an extension on his instructor's license which was due to expire 01/02/2016, he indicated that he was scheduled do a renewal on the E135/145 at the beginning of February 2016. He also indicated that his DE rating was still valid till August 2016. On the 7th December 2015, the authority granted him an extension in his instructor's ratings with conditions that it must be accompanied by ATP license and was only valid till 31 January 2016.

The Pilot's file showed that he had several ratings with different validity. C425 rating was valid only until 20/07/15 about six months prior to the accident.

The investigator examined the pilot logbooks to determine the hours logged on type. Only two hours on type were logged in the pilot's logbook in the proceeding eighteen months.

The Investigator-In-Charge interviewed persons from his work environment and family. The pilot's family described him as dedicated, passionate, 'did the right thing or rather not do it', knowledgeable and open minded.

His working conditions were sometimes demanding and stressful as he put a lot of time in his work researching even at home. He however managed his time well and nothing unusual came up the preceding months. He came from South Africa the previous day (Thursday) and spent time with the family, that evening he started planning for the flight and later slept at 20h00 Local time.

Flying Experience:

Total Hours	Approx. 11 686.56 as at (24th August 2015)
Total Past 90 Days	Information unavailable at the time of the accident.
Total on Type Past 90 Days	Information unavailable at the time of the accident.
Total on Type	Information unavailable at the time of the accident

Note: Information was unavailable due to incomplete logbooks.

Pilot 2

Nationality		Namibian			
Licence No	CA 22278	**Gender**	Male	**Age**	43
Licence valid		Yes	**Type Endorsed**	Yes	
Ratings		Single and Multi-engine			
Medical Expiry Date		31 January 2016			
Restrictions		None			
Previous Accidents		Unknown			

Flying Experience:

Total Hours	3765.4
Total Past 90 Days	63.1
Total on Type in 90 days	3.3
Total on Type	256.2

The 43 year-old held a Commercial Pilot's License (CA 22278) initially issued on 24 Jan 2005. The license included the ratings for C425 (PIC and IR) valid to 03/02/2017 as well as P1 on C208.

The class 1 medical certificate was issued on 09/07/2015 and valid to 31/01/2016 with no restrictions.

According to Smart Electronic Aviation Management Systems (SEAMS) records, the pilot's last commercial flight as a PIC was on Cessna T210 Centurion on the 25 January 2016 on which 6.0 hours were recorded as PIC.

On 03 February 2015, the pilot got the approval on his last check flight on a Cessna 425. The check record attested the qualification according to the DCA approved DE with stamp No. ASI 025. The general details of the skill test a per FSS PEL 61-41(DCA's Form for Skill Test for Instrument Ratings) showed that briefing was done for 1.0 hr, flying for 0.7 hours and de-briefing for 0.5 hours.

On 20 November 2012, the pilot had his check flight on a Cessna 425. The check record attested the qualification according to FSS PEL 61-32. The pilot's file from the DCA showed weakness in descent and arrival procedures (section 5 on the skill test).

The instructor made observations of that by stating that the basic handling was marginal, he recommended regular IF training sessions and simulator training. During the next check flight, the same DE observed the same weaknesses with the descent and arrival skill tests as well as the ILS approach procedures. A comment was made that the IF skills were a little sloppy and a bit unstable on all approaches, but within DCA limits. The DE again recommended regular simulator recurrence and refresher emergency training. In 2014 when the check flight was due the pilot requested an extension of 'Commercial Pilots licenses and all associated ratings,' which was granted by the DCA licensing unit for a period of two months. A different DE did a skill test on the 2nd February 2015 and deemed all sections on the skill test form satisfactory.

The documentation of the operator (but none from the Authority pilot's file) showed that the pilot had attended one day CRM training on 16 February 2015 valid for 12 months and a safety emergency procedures course in April 2014.

Prior to the accident, the pilot had a rest period of more than 15 hours. His last flight prior to the accident was conducted on 28th January 2016 at 08:00 hrs. The pilot had logged 2.1 hours on the C425 in the last 90 days

The Investigator-In-Charge interviewed persons from his work environment and family. The pilot's family described him as meticulous, organized and a good pilot. He had comfortable working condition. His greatest passions were flying and nature and enjoyed the fact that he could combine both while making a living out of it.

His working conditions were relaxed and flexible and worked more from home. According to them his finances were stable and didn't stress much about working conditions.

Pilot 3

Nationality		Namibian			
Licence No	CA 0079	Gender	Male	Age	62
Licence valid		Yes	Type Endorsed	Yes	
Ratings		Single and Multi-engine			
Medical Expiry Date		20 February 2016			
Restrictions		None			
Previous Accidents		Unknown			

Flying Experience:

Total Hours	Approx. 14140 (as at 1st June 2015)
Total Past 90 Days	Information unavailable at the time of the accident
Total on Type Past 90 Days	Information unavailable at the time of the accident
Total on Type	Information unavailable at the time of the accident

Note: Information was unavailable due to incomplete logbooks.

The 62 year-old held a Commercial Pilot's License (CA 0079) initially issued on 28 April 1987 and valid until 20/07/2020. His license included the ratings for C406/425 (PIC and IR) valid to 26/02/2017 as well as on P1 on F406, BE9L. C441, C208.

The pilot had an exemption on his license signed by the Minister responsible for Civil Aviation. EX-PEL003/2015 from the Civil Aviation Regulation 61.01.17

Curtailment of privileges of license holders aged 60 years or more 61.01.17
No holder of a pilot license who has attained the age of 60 years shall act as pilot-in-command of an aircraft engaged in any commercial air transport operations.

This exemption was drafted by the Director of Civil Aviation on which it stated that although Namibia's regulations did not allow pilots on this age group to fly as PIC for commercial air transport operations unless as a member of a multi-pilot crew and provided that member is the only one above 60 years. This fact was more restrictive than the International standard. Annex 1 of International Civil Aviation (ICAO) provides conditional acceptance for pilots above 60 (see below)

2.1.10. Limitation of privileges of pilots who have attained their 60th birthday and curtailment of privileges of pilots who have attained their 65th birthday.

A Contracting State, having issued pilot licenses, shall not permit the holders thereof to act as pilot of an aircraft engaged in ***international*** *commercial air transport operations if the license holders have attained their 60th birthday or, in the case of operations with more than one pilot, their 65th birthday.*

The submission from the Director: DCA recommended that the pilot be exempted from the restriction of regulation 61.01.17 that prevented the engagement of the pilot from commercial operations within the borders of Namibia, and the exemption should be effective until the promulgation of new Civil Aviation Regulations. (CARs).

The Minister accountable for transport signed the exemption on 15 July 2015 and was valid till the new revised regulations 61:01:16 were to be promulgated on which the exemption lapsed.

The pilot had a class 1 medical certificate that was issued on 21/08/2015 and valid to 20/02/2016 and had no restrictions (although the same medical examiner had required corrective lenses on 13/08/2014).

According to Smart Electronic Aviation Management Systems (SEAMS) records his last commercial flight as a PIC was on Cessna T210 Centurion on the 15 January 2016.

On 03 February 2015 the pilot got the approval on his last check flight on a Cessna 425. The check record attested the qualification according to DCA approved DE with stamp No. ASI 025.

The documentation of the operator showed that the pilot had attended one-day CRM training in 16 February 2015 valid for 12 months as well as safety emergency procedures course in April 2014.

Prior to the accident, the pilot had had a rest period of more than 15 hours. His last flight prior to the accident occurred on 28th January 2016 at 08:00 hrs.

DAAI interviewed persons from his work environment. His family described him as quiet, precise and a good pilot in a technical sense. The ergonomics on the cockpit after the new avionics systems installed in November 2015 was challenging. They stated that the height and airspeed were too close to each other.

His working conditions were relaxed and flexible and worked more from home. According to them his finances were stable and didn't stress much about working conditions.

Note: This pilot was not in control of the aircraft at the time of accident and was seated at the back.

1.6 Aircraft Information

Airframe:

The Cessna 425 is an all-metal, twin-engine, low-wing airplane aircraft configured as a cantilever low-wing monoplane with a conventional tail. The horizontal stabilizer employs a large dihedral angle in order to minimize its exposure to prop wash. The airframe is of aluminum Semi-Monocoque construction. Ground handling is aided by the proportionally wide track of the retractable tricycle landing gear that utilizes a single wheel on each unit. The airplane had a length of 10.93 m, a height of 3.84 m and a wingspan of 13.45 m.

Figure 1. An old photo of V5-MJW

Type	Cessna 425	
Manufacturer	Textron	
Aircraft Serial Number	425-0077	
Year of Manufacture	1981	
Total Airframe Hours (At time of accident)	5132.5[1] (Hobbs)	
Last Annual Inspection (Date & Hours)	19 November 2015	10095.7 hours
Hours since Last Annual Inspection	Information could not be determined	
C of A (Issue Date)	20 November 2015	
C of A (Expiry Date)	19 November 2016	
C of R (Issue Date) (Present owner)	20 October 2006	
Operating Categories	Standard A, C, D, E, F	

Engines:

	L/H	R/H
Type	P&W PT6-112	P&W PT6-112
Engine Serial Number	PCE-12159	PCE-12159
Hours since New	10,096	10,096
Hours since Overhaul	2,998	2,998

[1] The investigations could not establish the total Airframe time as it was not completed as required on the last three flight folios The last Flight Folio (45722) dated 24 January 2016 which was made available to the investigators by the owners of the aircraft indicated that the aircraft had accumulated 5132.5 engine Hobbs and AFTT: 10108,4 hours were calculated

Propellers	L/H	R/H
Type	McCauley	McCauley
Serial Number	110321	110338

The propellers were last maintained on the 19th November 2015 and released to service by AMO 074. The last overhaul (phase 3) was certified on 21 April 2015 according to McCauley MM no: MPC -26, Rev 3.

No Airworthiness Directives (ADs) or Service Bulletins were performed during the last annual inspection.

Avionics

The aircraft underwent substantial upgrade in its avionics systems. All Garmin Avionics were removed and replaced with Garmin Duel G600, GMA-35, GTN-650, GTN-750, GTX-33 and Avidyne TAS616 traffic system. Work was signed out on 18 November 2015, at 10085.7 hours and 9975 landings.

Form FSS AIR FORM 098/12 (Mandatory Periodic Inspection Report) indicated that the Mass and balance was conducted on 20/11/2015. However that form was signed-off on the 19 /11/2015.

1.7.1 Meteorological Information

Wind direction	140^0	Wind Speed	08KT	Visibility	<10Km
Temperature	26^0C	Cloud cover	FEW040	Cloud base	Nil
Dew point	13^0C				

1.8 Aids to Navigation

1.8.1 The aircraft was equipped with standard Navigation Aids applicable for this type.

1.9 Communications.

1.9.1 There was no communication problem reported. The pilot was transmitting on frequency 118.1 MHZ and 120.5 MHZ.
Automatic direction finding (ADF), Distance Measuring Equipment (DME), Aircraft radios transceivers (COMM), Navigation Equipment (NAV) were all replaced two months prior (November 2015).

1.10 Aerodrome Information

1.10.1 The accident happened approximately 300 meters from runway threshold Runway 26 NNE of the Airport.

1.11 Flight Recorders

1.11.1 The aircraft was not equipped with Flight Data Recorders (FDR) or Cockpit Voice Recorder (CVR) nor was it required by the regulation for this type of aircraft.

1.12 Wreckage and Impact Information

1.12.1 The aircraft impacted the bushy ground about 300 meters to the NNE of threshold of runway 26. The aircraft first made ground contact with the nose section. The empennage subsequently broke off and came to rest 10 meters from the main fuselage.

The extent of the impact and ensuing fire made it difficult to verify the different flight controls positions.

The propellers were found broken off at the point of impact and displayed little signs of rotational forces on the ground scars.

Figure 2. Photo showing the destroyed aircraft and ensuing post impact fire.

Figure 3. Photo showing the point of first impact and the rest of the aircraft.

Figure 4. Photo showing the broken off empennage

1.12.1 Engine Examination

The power plant investigation was performed on 1-4 March 2016 at a local AMO facility at Eros Airport, Windhoek, Namibia. The investigation team included an expert from the engine manufacturer Pratt and Whitney Canada. Review of the engine logbooks showed no unusual maintenance.

Both engines were received separated from the engine nacelle. The engines displayed severe impact and fire damage. The airframe propeller hubs were impact fractured from the propeller shaft.

Figure 5. Engine right hand view.

Figure 6. Reduction gearbox.

Figure 7 Propeller shaft and hub.

Figure 8 Propeller governor.

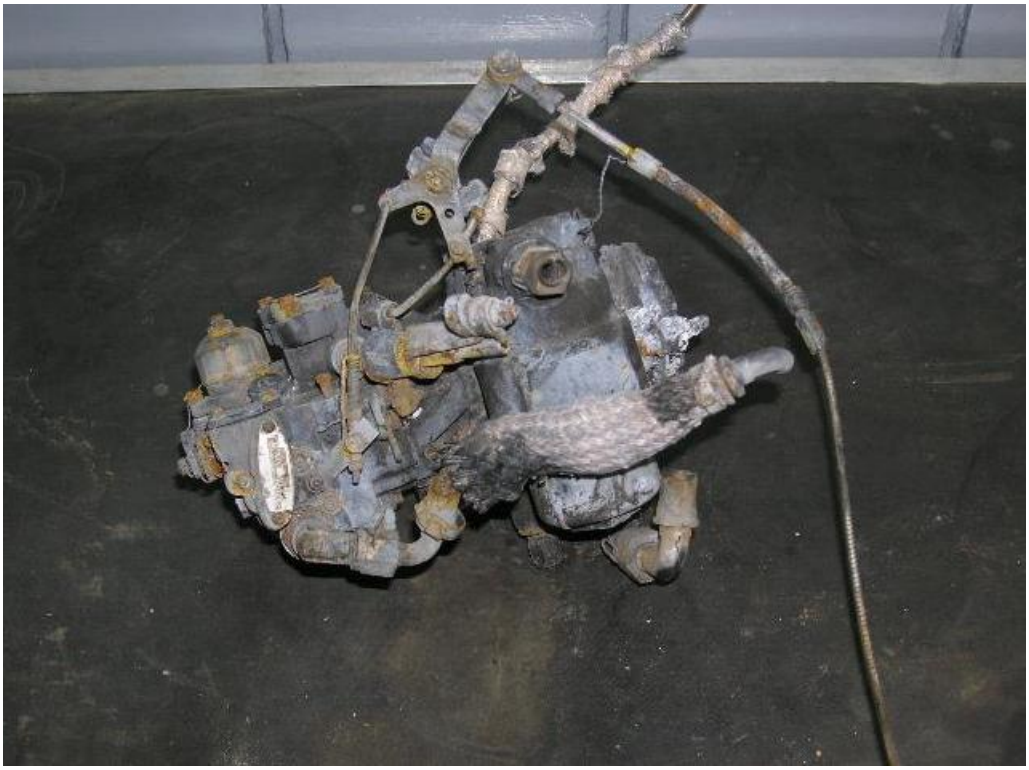

Figure 9 High pressure fuel pump and fuel control unit

Figure 10 left Engine as disassembled

Figure 11 Compressor stator vanes and shrouds, and centrifugal impeller, lower circumference

All of the stator airfoils were deformed sharply with the direction of compressor rotation, and displayed strong circumferential rubbing. The shroud face displayed circumferential rubbing due to contact with their adjacent blade airfoil.

Figure 11 Inter-stage baffle downstream side**.**

The disc face displayed severe circumferential rubbing and machining due to contact with power turbine guide vane ring. The disc hub showed heavy circumferential machining due to contact with the compressor turbine disc, through the inter-stage baffle.

Figure 12. Power turbine, upstream side.

1.13 Medical and Pathological Information

1.13.1 Pathological and toxicological examinations was concluded in Windhoek by National Forensic Science Institute. Request for non-human biological remains was done and examinations revealed that no such tissues Were discovered.

1.14 Fire

1.14.1 The aircraft impacted the ground at steep angle and a fireball was reportedly seen by the ATC. Fire and rescue services responded immediately after receiving confirmation from the tower. It took about ten minutes to reach the crash site and a further 4 minutes to extinguish the fire. According to the requirements, the fire and rescue services are required to reach the furthest point of the runway in three minutes. The firemen had to cut down the perimeter gate's chains to reach the crash scene. Water and foam was used to extinguish the fire.

1.3 Survival Aspects

1.15.1 Due to high impact forces and ensuing fire the accident was not survivable.

1.16 Tests and Research.

1.16.1 The power plant investigation was performed on 1-4 March 2016 at a local AMO facility at Eros Airport, Windhoek, Namibia. It revealed that both the left and right hand engines had severe impact damage and fire damage, including complete disintegration of the accessory gearbox housing. None of the engine mechanical components displayed any indications of any pre-impact anomalies or distress.

1.17 Organizational and Management Information

1.17.1 The flight was conducted for the renewal of both pilots CPL and IR.

1.17.2 The aircraft belongs to Eros Air.

1.17.3 Both Certificates (C of A and C of R) were valid at the time of the accident.

1.17.4 The last Mandatory Periodic Inspection (MPI) was carried out by AMO No. 074 on 20th November 2015 at 10095.7 airframe hours.

1.17.5 **Air Traffic Services**

The air traffic controller had a valid license certified appropriately.

The ATC requested the crew three times to respond on which he finally did on fourth attempt. V5-MJW established for localizer for an ILS 26. The DE then requested an early right hand turnout that was approved by the controller. Fifteen seconds later, the controller requested the position of the aircraft on which he didn't get a reply. He called three more times and there was no response.
About 20 seconds later, the fire and rescue services were heard on the ATC frequency requesting immediate response which was granted immediately.

1.17.6 **The Regulator**

The three pilots summary of flights on the type of aircraft were entered dually i.e. both on the log books and electronically on SEAMS system.

The Regulatory Authority had a DE (designated examiner) oversight hand-book and DE's manual. The DE manual is to be used as guidance for flight examiners to perform skill test and proficiency checks for issuance or renewal of their pilot licenses or ratings or to perform proficiency line checks in accordance with Parts 121,127 and 135. The hand-book contains policies, procedures, guidelines, information and instructions on the manner which those duties are to be performed.

The DE Examiners Oversight Handbook is to be used as guidance of inspectors in the performance of their duties regarding the designation and monitoring of examiners in terms of Part 61, 62,63,64,65, and 66.

1.18 Additional Information

1.18.1 Go-around manoeuvres

According to NAM-CATS-OPS 135.03.8:

(1) A pilot-in-command required to operate in the right-hand seat and carry-out the duties of co-pilot, or a pilot-in-command required to conduct training or examining duties from the right-hand seat, must complete additional training and checking as specified in the operations manual, concurrent with the operator proficiency checks prescribed in CAR 135.03.7. This additional training must include at least the following:

(a) An engine failure during take-off;

(b) A one-engine inoperative approach and go-around;

(c) A one-engine inoperative landing; and

(d) Category II or Category III operations, if applicable.

(2) When engine-out manoeuvres are carried out in the aeroplane, the engine failure must be simulated.

Note: During the competency checks the DE requested a 'Go-Around procedure which was accompanied by a request for an early right hand turnout.

1.18.2 Upgraded Avionics

The C425 had recently undergone substantial avionics upgrade. According to the Airframe logbook, a local Avionics and repair facility had removed all Garmin Avionics and installed Garmin Duel G600, GMA-35, GTN-750, GTN650, GTX-33 and Avidyne TAS616 traffic system. The work was completed and approved on the 18th November 2015 that was about two and half months before the accident.

1.19 Useful or Effective Investigation Techniques

1.19.1 None were conducted.

2 ANALYSIS

Aircraft

2.2.1 The left and right hand engines displayed severe impact damage and fire damage, including complete disintegration of the accessory gearbox housing. None of the engine mechanical components displayed any indications of any pre-impact anomalies or distress.

Flight Operations

2.2.2 The investigations looked at different scenarios in the absence of concrete factual evidence from traditional investigations such as GPS systems CVR, FDR etc. An asymmetrical thrust scenario cannot be ruled out, this is a situation where one engine was producing much more thrust as compared to its opposite causing the aircraft to veer to one direction. Lift would consequently increase exponential on one wing causing the aircraft to flip to the underpowered side, that phenomenal would be caused by either asymmetrical feathering of the propellers or a significant un-proportional thrust on the two engines. Although tests done on the two damaged engines indicated that they were operable at the time of the crash. The examination represents a

snapshot of the aircraft configuration/condition at the time of the crash, and not necessarily what it was in the moments preceding the impact. It is possible that the pilots were executing corrective actions to recover the aircraft from the upset, which would then indicate the condition represented during the examinations of the engines seeming as producing the correct amount of thrust for this phase of flight.

It should be noted that it's not uncommon in Namibia and elsewhere in the world where the flight crew were conducting a simulated single engine go-around in a multi-engine airplane. The practice is considered to be quite risky, and most flight operations prohibit such a training manoeuvre, except unless it is done in a simulator or at high altitude to assure enough altitude to recover should a degraded aerodynamic event occurs, such as a stall or V_{mc} roll, resulting in loss of control.

2.2.3 The DE examiners hand book section 2.7.2.

2.7.2 Duration of Delegation

An initial designation as examiner is valid for a maximum period of one year from date of designation, and thereafter for a period of 36 months.

2.7.3 Re-designation……

2.7.3.1 The responsibility to request re-designation prior to expiration of their current designation rests with the DE.(...).

2.7.3.2 (...)
(3) Designation of applicants is at the discretion of the Director and is dependent on the examiner –
(a) having attended at least one designated flight examiners conference/workshop under the auspices of the Directorate of Civil Aviation during the preceding 12 months from expiry of his/her current designation;

The practice of attending a flight examiners conference/workshop gives an opportunity for DE's to meet and share experiences and device corrective action plans to mitigate reoccurring safety deficiencies. It is a recommended practice that can greatly enhance safety. Despite it being documented on the DE manual the practice has largely not been implemented.

The pilot FSS-PEL 61-41 skill test conducted by a Grade II instructor/DE, revealed that during the license renewal test done in 2015, the Pilot 2 achieved a grading 3 in all his test areas. A grade 3 test score out of four is defined as meeting the Regulatory Authority expected standards.

On November 2013 the skill test was conducted by a Grade I instructor/DE which was broken down as briefing 1.1 hrs, flying 1.3 hrs. and de-brief 0.5 hrs. Several areas in the skill test were scored as grade 2.
'A grade 2 means below DCA expected standards, occasionally major deviation from qualification standards occurred, which may include momentary excursions beyond prescribed limits but these are recognized and corrected in timely manner.'

These include

1. Descend and arrival procedures
    - Setting and identification of Navigation aids, altimeter setting procedures
    - Approach preparation (briefing, checks, procedures)
2. ILS
    - Compliance with published approach procedures
    - Stabilised approach
    - Go-around and missed approach procedures

3. VOR/DME
    - Stabilised approach

4. Single Engine Aeroplane
    - Simulated engine failure after take-off

The DE general observation on this skill test concluded that IF skills were generally unstable although all approaches were within DCA limits. It was recommended that regular simulator time of about I hour monthly was needed.
FSS-PEL 61-41 skill test requires that should a candidate achieve a 2 in any aspect , he or she must be reassess in the ASPECT and examiner must indicate a number grading (1, 3or 4).

On November 2012 during the license renewal a grade 1 instructor DE TA22241 conducted a skill test in accordance with FSS-PEL 61-41 which was broken down as briefing 0.5 hrs., flying 1.1 hrs, and de-brief 0.8 hrs, again here several areas were documented as Grade 2. On sequence 5 and 6. The same recommendations were given.

2.2.4 FSS PEL 61-41 (civil aviation form for skill test) did not include a test for both Go-around and a simulated one engine inoperative at the same time however it's is not uncommon to have instructors requiring pilots to perform the manoeuvre. Performing a simulated one engine inoperative during a go around or approach is a highly risky operation if not unsafe, and most flight operations prohibit such a training manoeuvre, except unless it is done in a simulator or at high altitude to assure enough altitude to recover should a degraded aerodynamic event occurs, such as a stall or V_{mc} roll, resulting in LOC. Although there was no evidence to indicate this is what happened on this flight, the investigations revealed it was a common practice performed during the check flight the investigations feel the need to bring it to light as a prevention initiative.

2.2.5 On the 04 December 2015 the pilot (DE) applied to the authority for an extension on his instructor's license which was due to expire 01/02/2016, the pilot indicated that he was scheduled do a renewal on the E135/145 at the beginning of February 2016, he also indicated that his DE was still valid till August 2016. On the 7th December the authority granted him an extension in his instructor's ratings with conditions that it must be accompanied by ATP license and was only valid till 31 January 2016. The documentation from the authority and from the log book indicate that the DE had only flown 2.0 hour within the preceding eighteen (18) months but however conducted a check flight.

2.2.6 The Pilot's file showed that he had several ratings with different validity periods, C425 ratings were valid until 20/07/15 about six months prior to the accident. There was no evidence to indicate that he had applied to renew his C425 ratings or if it was granted.

2.2.7 Form FSS AIR FORM 098/12 (Mandatory Periodic Inspection Report) indicated that the Mass and balance was conducted on 20/11/2015. However that form was signed only on the 19 /11/2015.

2.2.8 The three pilots summary of flights on the type of aircraft were entered dually i.e. both on the logbooks and electronically on SEAMS system. Close inspections on their log books indicated that their records were not updated for a long period and there was discrepancies with the hours on the electronic systems SEAMS.

3 CONCLUSION

3.1 Findings

AIRCRAFT

3.1.1 The aircraft was certified, equipped and maintained in accordance with existing regulations and approved procedures.
3.1.2 The aircraft had a valid Certificate of Airworthiness and had been maintained in compliance with the existing regulations.
3.1.3 The mass and the center of gravity of the aircraft were within the prescribed limits
3.1.4 There was no evidence to indicate mechanical defect or malfunction that could have contributed to this accident.
3.1.5 The left and right hand engines displayed similar contact signatures to their internal components characteristic of the engines' developing symmetrical power in a high power range at the time of impact.
3.1.6 There were no indications of any pre-impact mechanical anomalies or dysfunction to any of the engine components observed that would have precluded normal engine operation.

CREW

3.1.7 The pilot 2/ pilot 3 were appropriately licensed and qualified for the flight in accordance with existing regulations, however there was no evidence that the DE had renewed his C425 rating.

3.1.8 The records indicate that the pilot, last flight as a Pilot/PIC on a Cessna 425 was on the 13 January 2015 on which 3.3 hours were recorded as PIC. The Pilot's file showed that he had several ratings with different validity periods, C425 ratings were valid until 20/07/15 about six months prior to the accident. There was no evidence to indicate that he had applied to renew his C425 ratings or if it was granted.

3.1.9 The DE's logbook was last entered on the 24th August 2015 on which 2:0 hrs. were accumulated on the C425 for the period 20 August 2014 to 24th August 2015.

FLIGHT OPERATIONS

3.1.8 At the time of the accident, the aircraft was owned by Eros Air and was operated under Part 135 OPSEC of Namibia Aviation Services (NAS). The flight was not authorized by Windhoek Flight Training center (WFTC) neither by Namibia Aviation Services (NAS) as this was not required.

3.1.9 The flight crew carried out normal radio communications with the relevant ATC units.
The investigations could not establish the total Airframe time as it was not completed as required on the last three flight folios. The last Flight Folio (45722) dated 24 January 2016 that was made available to the investigators by the owners of the aircraft indicated that the aircraft had accumulated 5132.5 Engine Hobbs.

AIR TRAFFIC SERVICES AND AIRPORT FACILITIES

3.1.10 The number of air traffic controllers on duty in the tower was not in accordance with the regulations.

3.1.11 The air traffic controller was properly licensed, medically fit and correctly rated to provide the services.

3.1.12 The ATC control tower had two emergency switches, one that was utilized previously and another as the new system. The ATC who was under duress pushed the old emergency button that was not operational.

REGULATORY AUTHORITY

3.1.13 The regulatory authority that authorizes all modifications to be done on the aircraft has an airworthiness file. In this file, document FSS-AIR-FORM 008G outlines various components of the Continuous Airworthiness program of a particular aircraft. Despite extensive avionics upgrades done on the aircraft that involved conversion of instrumentation from analogue system to a digital (glass cockpit), all these major modifications were not included into the authorities airworthiness file for the aircraft.

3.1.14 Mass and Balance was conducted on 20/11/2015 and found to be within limits as per mandatory periodic inspection report signed by the authority on 19/11/2015.

3.2 Probable Cause/s

The aircraft stalled at low altitude and consequently impacted the ground.

3.3 Contributory Factors

3.3.1 Loss of control of the aircraft.

3.3.2 Non-adherence of go-around procedures as set on the AIP.

3.3.3 Normalization of deviation -where non-standard go-around procedures are executed.

4. SAFETY RECOMMENDATIONS

4.1 *Safety recommendation number **006/2017 V5-MJW***

FSS PEL 61-41 SECTION 7A (b) shows a skill test subject /sequence simulated engine inoperative during approach. This is a risky approach test and should be reviewed and possibly restricted to simulator or high altitude to assure enough height to recover should a stall occur.

Consequently, DAAI recommends that NCAA review the practice and procedures.

4.2 *Safety recommendation number **007/2017 V5-MJW***

The practice of attending a flight examiners conference/workshop gives an opportunity for DE's to meet and share experiences and device corrective action plans to mitigate reoccurring safety deficiencies. It is a recommended practice that can greatly enhance safety.

Consequently, DAAI recommends that NCAA review the implementation of the program as articulated on its DE examiners handbook and in accordance to established good safety practices worldwide.

4.3 *Safety recommendation number **008/2017 V5-MJW***

The pilot's FSS-PEL 61-41 skill test conducted by a DE, revealed that during the license renewal test done in 2015. Pilot 2 achieved a grading 3 in some test areas. A grade 3 test score out of four is defined as meeting NCAA expected standards. The DE general observation on this skill test concluded that IF skills were generally unstable although all approaches were within DCA limits. It was recommended by the DE that regular simulator time of about one (1) hour monthly was needed. His licensed was renewed twice in the consecutive years without proof of compliance with the DE's recommendations.

Consequently, DAAI recommends that NCAA take safety action to address this issue.

Compiled by:

.....
Hafeni Mweshixwa
Investigator-in-charge

Date: 11/04/2017

Released by:

.....
Alpheus G !Naruseb, MP
MINISTER: MINISTRY OF WORKS AND TRANSPORT

Ministry of Works and Transport
12 APR 2017
Office of the MINISTER

Date: 2017/04/12

20