ACN: 2271901 *(1 of 29)*

Time / Day

Date : 202508
Local Time Of Day : 0601-1200

Place

Locale Reference.ATC Facility : ZZZ.Tower
State Reference : US

Aircraft

Reference : X
ATC / Advisory.Tower : ZZZ
Aircraft Operator : Fractional
Make Model Name : EMB-505 / Phenom 300
Crew Size.Number Of Crew : 2
Operating Under FAR Part : Part 91
Flight Plan : IFR
Mission : Ferry / Re-Positioning
Nav In Use : GPS
Nav In Use : FMS Or FMC
Flight Phase : Climb
Airspace.Class D : ZZZ

Component

Aircraft Component : AHRS/ND
Aircraft Reference : X
Problem : Failed

Person : 1

Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Reporter Organization : Fractional
Function.Flight Crew : Pilot Flying
Function.Flight Crew : First Officer
Qualification.Flight Crew : Air Transport Pilot (ATP)
Qualification.Flight Crew : Instrument
Qualification.Flight Crew : Multiengine
ASRS Report Number.Accession Number : 2271901
Human Factors : Situational Awareness

Person : 2

Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Reporter Organization : Fractional
Function.Flight Crew : Pilot Not Flying
Function.Flight Crew : First Officer
Qualification.Flight Crew : Commercial
Qualification.Flight Crew : Multiengine
Qualification.Flight Crew : Instrument
ASRS Report Number.Accession Number : 2271903

Events

Anomaly.Aircraft Equipment Problem : Critical
Detector.Automation : Aircraft Other Automation
Detector.Person : Flight Crew
When Detected : In-flight
Result.Flight Crew : Diverted
Result.Flight Crew : Overcame Equipment Problem
Result.Flight Crew : Requested ATC Assistance / Clarification
Result.Flight Crew : Landed in Emergency Condition
Result.Flight Crew : FLC complied w / Automation / Advisory
Result.Air Traffic Control : Provided Assistance

Assessments

Contributing Factors / Situations : Aircraft
Primary Problem : Aircraft

Narrative: 1

During enroute climb we received a HDG (Heading) flag, followed by an unreliable attitude indication on PFD 1 (Primary Flight Display). Shortly after we lost **AHRS** 1 causing us to receive several CAS (Crew Alerting System) messages and degraded instrumentation. CAS messages, **AHRS** 1 FAIL, YD (Yaw Damper) FAIL AP (Autopilot) FAIL. We lost autopilot and followed the QRH Procedure to go into revisionary mode on the PFD 1 using **AHRS**2. In descent company informed ATC to ask us to divert to ZZZ. we felt safe with that request. As we divert we received the SWPS (Stall Warning and Protection System) Fault. We advised ATC due to the lack of stall protection in addition to our other issues. We received several flags, first one was heading flag followed by the **AHRS** 1 FAIL, AP FAIL, YD FAIL. Additionally we lost autopilot. Later in flight we received the Fault Cass informing us of that issue. I believe all the issues were resulting from the **AHRS** 1 failing. With PFD 1 unreliable I transferred the controls to the FO to hand fly. I proceeded to follow the QRH procedure for **AHRS** 1 fault, YD fail, we had a discussion and both felt it was safe to continue to ZZZ1 airport. I was able to get in contact with maintenance and they believed ZZZ1 was a good place to have ground support look at the airplane. as we are getting closer ATC infomred us company requested we divert to ZZZ1. after a brief discussion we felt that it was safe for us to comply. We then received our SWPS Fault and followed the QRH. We then both agreed that it would be appropriate to [advise ATC]. we continue hand flying the entire flight and landed without incident. With this being a MX (Maintenance) issue its hard to describe a way we can improve. I do believe that overall our aircraft our maintained to the highest standards.

Narrative: 2

As we were climbing we experienced a HDG (Heading) flag. Next we noticed unreliable attitude indications on the PFD 1 (Primary Flight Display). Then we received the following CAS (Crew Alerting System) messages; **AHRS** 1 FAIL, AP (Autopilot) FAIL, YD (Yaw Damper) FAIL. Autopilot was turned off by the system. We hand flew the airplane and went through the QRH, which informed us to go into revisionary mode for PFD 1. During our descent the company had ATC ask us if we could divert from ZZZ2 to ZZZ1. We accepted the request as we felt we were in a safe condition to do so. Shortly after we had a SWPS (Stall Warning Protection System) FAULT CAS appear. We advised ATC since we wouldn't have any stall protection on top of the other CAS messages. HDG flag, **AHRS** 1 FAIL, AP FAIL and YD FAIL were the first CAS messages. From this, we lost autopilot. During descent we saw the SWPS FAULT CAS. **AHRS** 1 failure was the probable root cause. The PF transferred controls to me (PM) as he ran through the QRH for the **AHRS** 1 and YD messages. We hand flew the airplane once the AP Fail occurred. Once the QRH checklist was complete we decided we could continue to ZZZ2. Since I had the controls and radios, the PF made contact with maintenance, who told us ZZZ1 is better than returning to ZZZ for maintenance. ATC notified us that the company would like for us to go to ZZZ1, if possible. We decided to divert to ZZZ1 as we felt it could be done safely. A SWPS FAULT CAS appeared, which made us feel unsafe, resulting in us [advising ATC]. This was a maintenance problem, so we aren't too sure what the root cause of it was. We did a great job using CRM to balance the workload and land the plane without issues. **AHRS** FAILURE (1), no autopilot, no YD, stall warning protection fault.

Synopsis

Fractional pilot crew reported the loss of the #1 **AHRS** which caused other multiple instrument failures.

ACN: 2268342 *(2 of 29)*

Time / Day

Date : 202507

Aircraft

Reference : X
Aircraft Operator : Fractional
Make Model Name : EMB-505 / Phenom 300
Crew Size.Number Of Crew : 2
Operating Under FAR Part : Part 91
Flight Plan : IFR
Mission : Passenger
Flight Phase : Cruise

Component

Aircraft Component : Autopilot
Aircraft Reference : X
Problem : Malfunctioning

Person : 1

Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Reporter Organization : Contracted Service
Function.Flight Crew : First Officer
Qualification.Flight Crew : Air Transport Pilot (ATP)
ASRS Report Number.Accession Number : 2268342

Person : 2

Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Reporter Organization : Contracted Service
Function.Flight Crew : Pilot Not Flying
Function.Flight Crew : Captain
Qualification.Flight Crew : Air Transport Pilot (ATP)
ASRS Report Number.Accession Number : 2268343

Events

Anomaly.Aircraft Equipment Problem : Critical
Detector.Automation : Aircraft Other Automation
Detector.Person : Flight Crew
When Detected : In-flight
Result.Flight Crew : Inflight Shutdown
Result.Air Traffic Control : Provided Assistance

Assessments

Contributing Factors / Situations : Aircraft
Primary Problem : Aircraft

Narrative: 1

As we were on cruise flight at FL450 we had an "**AHRS** 1 Failed" message with associated Autopilot and Yaw damper failure. We proceeded to disconnect the autopilot, hand fly the aircraft and ran the associated checklists. Flight continued with no further issues.

Narrative: 2

While in level cruise at FL450 I felt the autopilot begin a slow uncommanded left roll. I instructed PF (an IOE student) to disconnect the autopilot and level the airplane. Anticipating an **AHRS** issue I told PF to hand-fly the airplane using the flight director on the right PFD (Primary Flight Display). Shortly after this we received an aural "AUTOPILOT AUTOPILOT" warning, with red AP (Autopilot) FAIL and YD (Yaw Damper) FAIL CAS messages, and a yellow **AHRS** 1 FAIL CAS message. PF decoupled the autopilot and began hand flying, but had some small variations in pitch resulting in altitude fluctuations of approximately +/- 100 feet. I took the controls and stabilized the airplane back at FL450, coupled the flight director to my (right) side, and handed the QRH to the other pilot to run the **AHRS** 1 FAIL checklist, AP FAIL checklist, and YD FAIL checklist. We discussed the situation and decided to continue the flight to our destination, hand-flying the airplane. I transferred the controls back to the other pilot, and contacted ATC to inform them that we had an autopilot failure and were no longer RVSM-capable. ATC acknowledged. We continued hand-flying for approximately 1.5 hours until we arrived at ZZZ, transferring controls back and forth as needed to avoid pilot fatigue. At some point during cruise I emailed MX (Maintenance) to notify them of the failure and that the airplane would be grounded when we landed at ZZZ.

Synopsis

EMB-505 flight crew reported while in cruise flight experiencing an **AHRS** failure resulting in the flight crew hand flying the aircraft to their destination airport.

ACN: 2235756 *(3 of 29)*

Time / Day

Date : 202504

Place

Locale Reference.Airport : RDU.Airport
State Reference : NC

Altitude.MSL.Single Value : 2500

Environment

Flight Conditions : VMC
Weather Elements / Visibility : Turbulence
Light : Daylight
Ceiling.Single Value : 18000

Aircraft

Reference : X
ATC / Advisory.Tower : RDU
Aircraft Operator : Personal
Make Model Name : Small Aircraft, Low Wing, 1 Eng, Retractable Gear
Crew Size.Number Of Crew : 1
Operating Under FAR Part : Part 91
Flight Plan : VFR
Mission : Personal
Flight Phase : Initial Climb
Route In Use : Direct
Airspace.Class C : RDU

Component

Aircraft Component : AHRS/ND
Aircraft Reference : X
Problem : Malfunctioning

Person

Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Reporter Organization : Personal
Function.Flight Crew : Single Pilot
Function.Flight Crew : Pilot Flying
Qualification.Flight Crew : Multiengine
Qualification.Flight Crew : Private
Qualification.Flight Crew : Instrument
Experience.Flight Crew.Total : 1200
Experience.Flight Crew.Last 90 Days : 30
Experience.Flight Crew.Type : 1000
ASRS Report Number.Accession Number : 2235756

Events

Anomaly.Aircraft Equipment Problem : Less Severe
Anomaly.Deviation / Discrepancy - Procedural : Hazardous Material Violation
Detector.Person : Flight Crew
When Detected : In-flight
Result.General : Maintenance Action
Result.Flight Crew : Overcame Equipment Problem

Assessments

Contributing Factors / Situations : Aircraft
Primary Problem : Aircraft

Narrative: 1

Complete **AHRS** failure with the exception of altimeter and airspeed. Caused by speaker in the baggage compartment (magnets). VFR conditions, loss of navigation and heading indicator, unreliable compass heading, impossible wind speeds indicated. Situation resolved when speaker/magnet removed from baggage area. Hoping the FAA can inform the public of failures caused by speakers and other common magnets near vital components and computers in modern aircraft. Outcome would have been completely different if the situation would have occurred in IMC conditions. Aircraft scheduled for pitot-static check out of abundance of caution, even though all systems are indicating back to normal.

Synopsis

General aviation pilot flying reported having complete **AHRS** failure due to an item in the baggage compartment, a speaker with magnet components, affecting the aircraft's systems.

ACN: 2220866 *(4 of 29)*

Time / Day

Date : 202503
Local Time Of Day : 0601-1200

Place

Locale Reference.Airport : ZZZ.Airport
State Reference : US
Relative Position.Angle.Radial : 270
Relative Position.Distance.Nautical Miles : 5
Altitude.MSL.Single Value : 4500

Environment

Flight Conditions : IMC
Weather Elements / Visibility.Visibility : 10
Light : Daylight
Ceiling.Single Value : 3000

Aircraft

Reference : X
ATC / Advisory.TRACON : ZZZ
Aircraft Operator : FBO
Make Model Name : Skyhawk 172/Cutlass 172
Crew Size.Number Of Crew : 2
Operating Under FAR Part : Part 91
Flight Plan : IFR
Mission : Training
Flight Phase : Descent
Route In Use : Direct
Airspace.Class E : ZZZ

Component

Aircraft Component : AHRS/ND
Aircraft Reference : X
Problem : Failed

Person

Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Reporter Organization : FBO
Function.Flight Crew : Instructor
Function.Flight Crew : Pilot Not Flying
Qualification.Flight Crew : Commercial
Qualification.Flight Crew : Instrument
Qualification.Flight Crew : Multiengine
Qualification.Flight Crew : Flight Instructor
Experience.Flight Crew.Total : 1015
Experience.Flight Crew.Last 90 Days : 117
Experience.Flight Crew.Type : 560
ASRS Report Number.Accession Number : 2220866
Human Factors : Troubleshooting
Human Factors : Situational Awareness
Human Factors : Time Pressure

Events

Anomaly.Aircraft Equipment Problem : Critical
Anomaly.Deviation / Discrepancy - Procedural : Published Material / Policy
Detector.Person : Flight Crew
When Detected : In-flight
Result.Flight Crew : Overcame Equipment Problem
Result.Flight Crew : Requested ATC Assistance / Clarification
Result.Air Traffic Control : Provided Assistance

Assessments

Contributing Factors / Situations : Aircraft
Primary Problem : Aircraft

Narrative: 1

The aircraft involved is a new (<1 year old) Cessna 172 with the G1000 NXi (Nav III) avionics suite. I squawked this particular aircraft the previous time I had flown it, approximately three days prior, for an in-flight **AHRS** failure. In the previous incident, another student and I were departing VFR from a satellite airfield having done a stop-n-go. As we were

climbing out of the airport vicinity, I glanced at the PFD (Primary Flight Display) to ascertain his speed and noticed the attitude showed us in a right bank of about 10º. It had been turbulent all day so that would not have been completely unusual, but because I hadn't felt the bank, I looked up to observe the natural horizon and realized the PFD attitude indicator was not correctly displaying attitude information. It quickly went black and flashed red Xs before an **AHRS** Align message displayed. Another instructor advised me that she had experienced this once before and that a third had as well. The maintenance entry returning the aircraft to service stated connections had been cleaned and checked but the issue could not be replicated. On the day of this reported incident, I was on an IFR flight plan with a student proceeding from ZZZ1 direct to ZZZ, initially at 5,000 MSL. We were in and out of clouds throughout the flight, probably 70-80% of the flight was without either contact with the ground or a discernible horizon. At about 15 miles from ZZZ, we were given descent instructions and began to comply. At approximately 4,500 MSL, I noticed a turn on the HSI (Horizontal Situation Indicator) that didn't match up with our attitude information. I looked at the standby attitude indicator, a Garmin GI-275, and also did not match our PFD's attitude information. I directed my student to use the supporting turn indications to break the tie and help keep the wings level until we descended into VMC. I advised ZZZ Approach (XXX.X) that we were experiencing **AHRS** failure, had a backup, and would like to avoid continued flight in IMC once we exited. This time, the **AHRS** never seemed to reset itself, i.e. the screen never blanked, put up red Xs, or otherwise warned us of failure. We also reported that we needed no emergency assistance at that time and that we would continue the flight in VMC. We broke out of the clouds at about 3,500-4,000 MSL and continued the flight. We were queried about our intentions to remain on the IFR flight plan or to return to ZZZ1 on VFR Flight Following. I initially said that we could do "whatever is easiest for you" as I was confident that we could maintain basic VFR on the return trip. We were directed to ZZZ, about 10 miles ahead. My student called the airport in sight but ATC caught that we had instead spotted ZZZ2. We reset our expectations and continued onto ZZZ for a touch-n-go. During the return flight, we were handed off to one of the satellite sectors (can't remember if it was XXX.Y or XXX.XX). As we continued northwest-bound, we were asked to climb to 4,000 for traffic. I reminded the new controller that we had previously experienced an **AHRS** failure and that I would not be willing to re-enter IMC. At this point, we were in level cruise flight at 3,000 MSL with a cloud layer very nearly above us. A climb would have put us back into the clouds. He then gave me a vector to the north and around the traffic. We cancelled IFR as soon as we had the field in sight and squawked the airplane again. I think we handled the initial problem well enough. Finding conflicting information, we sought other information to complete the picture, break the tie. A lot of EFIS (Electronic Flight Instrument System) failure training is focused on various elements showing a red X when a component becomes unreliable. That did not happen on this occasion. I was able to record a video showing both attitude indicators with a 5º difference in bank. When queried by ATC about our intentions, I initially told her that we could remain on our IFR flight plan or switch to flight following, whatever was easiest for them. Looking back, I am glad we were kept on the IFR flight plan and I wish I had said as much initially. There are several towers and other obstacles near ZZZ2 that were not very far below us. To maintain basic VFR, we would have had to descend and would have been closer to these obstacles. I understand that we did not declare an emergency, but we were in a precarious situation. When we got handed off to the second controller on our return leg, he asked us to climb for traffic, which would have put us back in the clouds. He didn't give us any difficulty when I refused his instructions and explained why. I think either I could have called a PAN-PAN or perhaps there is an opportunity for this type of situation to get explained when an aircraft is handed off to the next controller. I've been to the ZZZ TRACON and know that these two frequencies are on different walls, so the second controller would not have been fully aware of the issue as it developed.

Synopsis

C-172 Flight instructor reported a loss of **AHRS** in IMC during descent. Instructor received ATC assistance to continue to destination airport.

ACN: 2157976 *(5 of 29)*

Time / Day

Date : 202408
Local Time Of Day : 0601-1200

Place

Locale Reference.Airport : ZZZ.Airport
State Reference : US
Altitude.AGL.Single Value : 0

Environment

Weather Elements / Visibility : Turbulence
Light : Daylight

Aircraft

Reference : X
ATC / Advisory.CTAF : ZZZ
Aircraft Operator : FBO
Make Model Name : SR20
Crew Size.Number Of Crew : 2
Operating Under FAR Part : Part 91
Mission : Training
Flight Phase : Landing
Airspace.Class G : ZZZ

Person

Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Reporter Organization : FBO
Function.Flight Crew : Trainee
Function.Flight Crew : Pilot Flying
Qualification.Flight Crew : Student
ASRS Report Number.Accession Number : 2157976
Human Factors : Fatigue
Human Factors : Physiological - Other
Human Factors : Time Pressure
Human Factors : Training / Qualification

Events

Anomaly.Inflight Event / Encounter : Weather / Turbulence
Anomaly.Inflight Event / Encounter : Loss Of Aircraft Control
Anomaly.Inflight Event / Encounter : Unstabilized Approach
Detector.Person : Flight Crew
When Detected : In-flight
Result.Flight Crew : Executed Go Around / Missed Approach

Assessments

Contributing Factors / Situations : Human Factors
Contributing Factors / Situations : Weather
Primary Problem : Ambiguous

Narrative: 1

Coming in to land at ZZZ, we were slightly high and slow on the approach. Around the threshold, we were slightly high and slow, so pilot flying added a little power and pitched down. The flare was done too high, so combined with being too slow and the winds variable and gusting, the plane lost energy and dropped a significant amount on the runway, resulting in a large bounce. Pilot flying executed a go around to return for landing, and the PFD flickered and two white CAS messages showed, saying the autopilot and the PFD were using different ADC and **AHRS**. Pilot monitoring and passenger helped talk pilot flying through the shock and nerves. The CAS messages disappeared about ten seconds after, and a second landing was made, this one a lot smoother and normal. Fatigue and pressure to land probably played a part.

Synopsis

Student pilot reported being high and slow on approach which resulted in a high flare and a large bounce.

ACN: 2146927 *(6 of 29)*

Time / Day

Date : 202407
Local Time Of Day : 1201-1800

Place

Locale Reference.ATC Facility : ZZZ.Tower
State Reference : US

Environment

Flight Conditions : VMC

Aircraft

Reference : X
ATC / Advisory.TRACON : ZZZ
Aircraft Operator : FBO
Make Model Name : DA40 Diamond Star
Crew Size.Number Of Crew : 2
Operating Under FAR Part : Part 91
Flight Plan : VFR
Mission : Training
Flight Phase : Initial Climb
Airspace.Class C : ZZZ

Component

Aircraft Component : AHRS/ND
Aircraft Reference : X
Problem : Malfunctioning

Person

Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Reporter Organization : FBO
Function.Flight Crew : Instructor
Qualification.Flight Crew : Instrument
Qualification.Flight Crew : Commercial
Qualification.Flight Crew : Flight Instructor
ASRS Report Number.Accession Number : 2146927
Human Factors : Confusion
Human Factors : Distraction
Human Factors : Training / Qualification
Human Factors : Troubleshooting
Human Factors : Workload

Events

Anomaly.Aircraft Equipment Problem : Critical
Detector.Person : Flight Crew
When Detected : In-flight
Result.General : Flight Cancelled / Delayed
Result.Flight Crew : Overcame Equipment Problem
Result.Flight Crew : Returned To Departure Airport
Result.Flight Crew : Requested ATC Assistance / Clarification
Result.Air Traffic Control : Issued New Clearance

Assessments

Contributing Factors / Situations : Aircraft
Primary Problem : Aircraft

Narrative: 1

On departure out of ZZZ after departure had cleared us to squawk VFR, we exprienced **AHRS** Failure for roughly 2 minutes, then the **AHRS** came back on, we immediately got back on with departure and requested to come back for maintenance. There were no more issues after that.

Synopsis

A flight school Instructor reported they experienced a temporary heading and attitude indicator failure on initial climb and returned to departure airport.

ACN: 2119457 *(7 of 29)*

Time / Day

Date : 202405
Local Time Of Day : 1201-1800

Place

Locale Reference.Airport : ZZZ.Airport
State Reference : US
Relative Position.Angle.Radial : 135
Relative Position.Distance.Nautical Miles : 3
Altitude.MSL.Single Value : 2500

Environment

Flight Conditions : Mixed
Weather Elements / Visibility.Visibility : 10
Light : Daylight
Ceiling.Single Value : 4000

Aircraft

Reference : X
Aircraft Operator : Personal
Make Model Name : Skyhawk 172/Cutlass 172
Crew Size.Number Of Crew : 1

Operating Under FAR Part : Part 91
Flight Plan : IFR
Mission : Personal
Flight Phase : Climb
Route In Use : Direct

Component : 1

Aircraft Component : Attitude Indicator(Gyro/Horizon/ADI)
Aircraft Reference : X
Problem : Failed

Component : 2

Aircraft Component : AHRS/ND
Aircraft Reference : X
Problem : Failed

Person

Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Reporter Organization : Personal
Function.Flight Crew : Single Pilot
Function.Flight Crew : Pilot Flying
Qualification.Flight Crew : Private
Qualification.Flight Crew : Instrument
Experience.Flight Crew.Total : 200
Experience.Flight Crew.Last 90 Days : 9.3
Experience.Flight Crew.Type : 57
ASRS Report Number.Accession Number : 2119457
Human Factors : Situational Awareness
Human Factors : Troubleshooting
Human Factors : Workload
Human Factors : Confusion

Events

Anomaly.Aircraft Equipment Problem : Critical
Result.Flight Crew : Landed in Emergency Condition
Result.Flight Crew : Returned To Departure Airport
Result.Flight Crew : Requested ATC Assistance / Clarification
Result.Air Traffic Control : Provided Assistance

Assessments

Contributing Factors / Situations : Aircraft
Primary Problem : Aircraft

Narrative: 1

I was on an IFR currency flight. The aircraft has a Dynon Skyview PFD (Primary Flight Display) and a Dynon backup AI, altitude and airspeed. I had flown from ZZZ1 to ZZZ largely in IMC. I had the pitot heat on and the outside air temp in the clouds was 44F. After shooting the RNAV XX and completing a touch and go, I was climbing in VMC when the attitude indicator tumbled to full nose up, then full nose down. Even in VMC this was incredibly disorienting, as I was concentrating on flying a precise heading. Once I looked at the ground and reoriented myself, I noted that the airspeed indicator was cycling between 0-20 knots and the angle of attack audible warning indicator was beeping. I verified the pitch and power settings and continued to climb. The backup/secondary airspeed indicator was also showing similar erroneous values. I called ZZZ Center (we were already in communication) and let them know my gyros had tumbled and I had no primary or secondary airspeed. I cancelled IFR and they offered to keep me on Flight Following, which I welcomed. I realize now it was an ADC/**AHRS** failure, not a tumbling gyro, but that's what came to mind to describe what was happening to ATC. I elected to continue back to my home airport at ZZZ1 because I was confident in my ability to fly pitch and power in cruise. I also wanted the longer runway and emergency services at ZZZ1. It was really only slowing down during the approach to landing that I was worried about. ZZZ Center offered ideas to try and troubleshoot the issue. That was great, but unfortunately nothing worked. Once I was handed off to ZZZ Approach on XXX.XX, I [requested priority handling] and asked for fire/rescue equipment. I also informed Approach that I would be making a right base entry to RWY XY, which was the entry with the least amount of turns and the most descending in a straight line from where I was. I landed at a higher speed than normal with flaps 10. I was guesstimating my airspeed by adjusting my GPS groundspeed by the known wind. ZZZ Tower gave me a groundspeed callout on the base-to-final turn which I appreciated. I floated a bit, but the landing was not a big deal and I taxied to parking. I want to specifically note the assistance provided by ATC. All of the controllers I spoke with, before and after [requesting priority handling], were calm and helpful, and anticipated things I might want to know or be asking for. I felt like I wasn't alone (I was the only person in the aircraft). I am also thankful this event happened while I was flying the club plane. During primary training, my instructor covered all the flight instruments with paper and had me fly traffic patterns by feel alone. So, even though I was nervous, I had confidence that I could handle the situation because I'd done it before. I am sure not all of the pilots in my club got that during primary training.

Synopsis

A Cessna 172 pilot reported a complete failure of aircraft flight instruments, resulting in a return to the departure airport.

ACN: 2094329 *(8 of 29)*

Time / Day

Date : 202403
Local Time Of Day : 1201-1800

Place

Locale Reference.ATC Facility : ZZZ.ARTCC
State Reference : US
Altitude.MSL.Single Value : 40000

Environment

Flight Conditions : Mixed
Weather Elements / Visibility : Icing
Weather Elements / Visibility.Visibility : 10
Light : Daylight
Ceiling.Single Value : 12000

Aircraft

Reference : X
ATC / Advisory.Center : ZZZ
Aircraft Operator : Corporate
Make Model Name : EMB-505 / Phenom 300
Crew Size.Number Of Crew : 2
Operating Under FAR Part : Part 91
Flight Plan : IFR
Mission : Ferry / Re-Positioning
Flight Phase : Climb
Route In Use : Direct
Airspace.Class A : ZZZ

Component : 1

Aircraft Component : Autopilot
Aircraft Reference : X
Problem : Failed

Component : 2

Aircraft Component : Navigational Equipment and Processing
Manufacturer : Garmin
Aircraft Reference : X
Problem : Failed

Component : 3

Aircraft Component : Communication Systems
Aircraft Reference : X
Problem : Failed

Person : 1

Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Reporter Organization : Corporate
Function.Flight Crew : Captain
Function.Flight Crew : Pilot Flying
Qualification.Flight Crew : Air Transport Pilot (ATP)
Qualification.Flight Crew : Instrument
Qualification.Flight Crew : Multiengine
Experience.Flight Crew.Total : 4850
Experience.Flight Crew.Last 90 Days : 165
Experience.Flight Crew.Type : 788
ASRS Report Number.Accession Number : 2094329
Human Factors : Confusion
Human Factors : Human-Machine Interface

Human Factors : Workload
Human Factors : Communication Breakdown
Communication Breakdown.Party1 : Flight Crew
Communication Breakdown.Party2 : ATC
Analyst Callback : Completed

Person : 2

Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Reporter Organization : Corporate
Function.Flight Crew : Pilot Not Flying
Function.Flight Crew : First Officer
Qualification.Flight Crew : Instrument
Qualification.Flight Crew : Multiengine
Qualification.Flight Crew : Air Transport Pilot (ATP)
Experience.Flight Crew.Total : 6080
Experience.Flight Crew.Last 90 Days : 40
Experience.Flight Crew.Type : 1600
ASRS Report Number.Accession Number : 2094330
Human Factors : Communication Breakdown
Human Factors : Human-Machine Interface
Human Factors : Troubleshooting
Human Factors : Workload
Human Factors : Confusion
Communication Breakdown.Party1 : Flight Crew
Communication Breakdown.Party2 : ATC

Events

Anomaly.Aircraft Equipment Problem : Critical
Detector.Person : Flight Crew
When Detected : In-flight
Result.General : Maintenance Action
Result.General : Flight Cancelled / Delayed
Result.Flight Crew : Diverted
Result.Flight Crew : Requested ATC Assistance / Clarification
Result.Flight Crew : Landed in Emergency Condition
Result.Flight Crew : Overcame Equipment Problem
Result.Air Traffic Control : Issued New Clearance
Result.Air Traffic Control : Provided Assistance

Assessments

Contributing Factors / Situations : Aircraft
Primary Problem : Aircraft

Narrative: 1

On our planned ferry flight from ZZZ1 to ZZZ2 to deliver the airplane to a pre-purchase inspection, we were climbing through 40,000 ft. in IMC when we heard the autopilot disconnect aural warning. When we checked the PFD (Primary Flight Display) it showed the autopilot engaged but then it disconnected again with the aural and visual warnings going off. At this point we were being handed off from ZZZ1 Center to ZZZ Center and I pressed and held the autopilot quick disconnect button to prevent the autopilot from reengaging and began to hand-fly. I briefly continued the climb as our last clearance was to climb to 43,000 ft. when all of a sudden the Garmin 3000 went haywire. It seemed as though any setting or mode that could be changed by the pilot was being changed randomly, as if someone was pushing every button at the same time. Due to the baro setting being changed randomly, our altitude became unreliable so I initiated a descent and a turn back to the east, away from the weather and towards known VMC conditions, and the pilot not flying [requested priority handling] with ZZZ Center. The GTCs (Garmin) that contain the radio controls began to behave erratically and the radios began swapping between emergency mode and our previously input frequency so at that point we became concerned our transponder was also not reporting properly so we squawked XXXX. I then continued the descent and turn eastbound while the pilot not flying continued to attempt to contact ZZZ Center. We broke out of the cloud layer at about 20,000 ft. and I initiated a turn towards ZZZ as I could see the ground in that direction. Passing through about 17,000 ft. the radios began to stabilize and contact was regained with ZZZ Center, signaling the beginning of the total stabilization of the G3000 system. I continued to hand-fly as I did not want to risk engaging the autopilot and having another issue and we squawked normal and were handed off to ZZZ Approach for a safe landing on Runway XXR. We taxied in with no assistance and shut down normally. After shutdown, plugged in a ground power unit to perform a central maintenance computer download to send to Maintenance and after about 15 minutes on ground power, the same symptoms occurred and lasted for roughly twenty minutes. The aircraft will remain on the ground in ZZZ until maintenance personnel can travel to and inspect the airplane.

Callback: 1

Reporter stated the anomaly was determined to be spurious signals emitted by the Garmin Primary Flight Display #2. Reporter further stated this was a known issue and has happened in the past.

Narrative: 2

Flight was a planned reposition from ZZZ1 to ZZZ2 to a maintenance facility for pre-buy inspection. Crew consisted of 2 Phenom 300 pilots, both single pilot typed, with significant experience in type. I was the pilot not flying for this flight as insurance had mandated a 2-pilot, typed, and current crew. We arrived at ZZZ1 to begin preflight prep. We re-evaluated weather and discussed an appropriate flight plan before filing and planning to depart. We completed preflight actions and taxied to Runway XX for a VFR departure to the west. We picked up our IFR clearance shortly after takeoff and were initially cleared to 23,000 ft. and on course as filed over ZZZ. We were eventually cleared to our filed altitude of 43,000 ft. Conditions in the climb were VMC until above 12,000 ft. and then solid IMC in fairly smooth air until nearing 39,000 ft. where we began to intermittently break out on top. As ZZZ1 Center was handing us off to ZZZ [Center] while we were in between ZZZ and ZZZ3, the autopilot disconnected and re-engaged multiple times in a short time span. We also noticed multiple changes rapidly occur on the avionics displays and settings. As we checked in with ZZZ Center, we informed them of the avionics issues and our decision to turn back to ZZZ and made the decision to [request priority handling]. Due to the unreliability of our avionics, questionable navigation capability, and the pilot flying having to hand-fly and continuously hold the quick disconnect button to prevent the autopilot from re-engaging in an unknown state, I requested headings and a descent towards VMC conditions. At this point, every setting that could possible be changed, i.e., altimeter setting, altimeter units, nav source, radio frequencies, autopilot modes, yaw damper engagement, and pitch trim movement, were all in question. The best way to describe it afterwards was it was like someone was pushing every soft key on the Garmin G3000 displays repeatedly. The baro setting repeatedly cycled through all units it can be set to and at a couple of points the altimeters displayed meters. During all this, communications with ATC and internally between the pilots was very difficult. The radios would switch frequencies uncommanded, switch to an emergency mode, and turn to maximum volume randomly. We would have intermittent contact with ATC and other aircraft over XXX.X during our initial turns and descent. As transponder code would also randomly change, we were extremely concerned as to whether our transponder was actually providing an accurate position. The **AHRS** held pretty stable and when comparing PFD (Primary Flight Display) 1, PFD 2, and standby source airspeed, we never felt there was a question of if it was correct. We were initially turned north and given a descent to FL270 and then a further descent to FL200 as ZZZ turned us east. Nearing 20,000 ft. we noticed that we were VMC and could see ZZZ and began a turn towards the airport. We were cleared further descent to 13,000 ft. and switched over to ZZZ Approach. Once we were around 17,000 ft., the conditions began to subside and happen at a much less frequent rate. Radio communications became stable and we were able to continue descent and be vectored for a visual approach to Runway XXR. The pilot flying continued to hand-fly the aircraft and I directed checklists to complete all normal actions, including approach brief and computation of landing data leading up to our approach and landing. We landed after a total duration of 0.7 hours and taxied into the FBO with no further assistance required. Prior to leaving the aircraft, we contacted our maintenance facility and conducted some troubleshooting and avionics downloads. Approximately 15 minutes after applying power to the aircraft, we noticed the same conditions we observed inflight re-occur on the ground. The autopilot would engage un-commanded, in random modes, change nav sources, and at times would not disengage via the quick disconnect button or autopilot button on the control panel. It would run the pitch trim to the nose up and down limits unless interrupted with the quick disconnect switch. We also observed the altimeter units and barometric unit settings rapidly change on their own and the radios enter emergency mode as we had seen inflight. The aircraft is currently grounded until further maintenance investigation takes place.

Synopsis

Phenom 300 flight crew reported the Garmin 3000 system malfunctioned and caused various settings to change erratically. Communication with ATC was difficult and the transponder code would also randomly change. The flight crew diverted to an alternate airport. On the ground, the same conditions reoccurred when the flight crew was applying power to the aircraft.

ACN: 2050737 *(9 of 29)*

Time / Day

Date : 202310
Local Time Of Day : 0601-1200

Place

Locale Reference.Airport : ZZZ.Airport
State Reference : US
Relative Position.Angle.Radial : 210
Relative Position.Distance.Nautical Miles : 8
Altitude.MSL.Single Value : 9000

Environment

Weather Elements / Visibility : Icing
Weather Elements / Visibility : Rain
Weather Elements / Visibility : Turbulence
Weather Elements / Visibility.Visibility : 9
Light : Dawn
Ceiling.Single Value : 3000

Aircraft

Reference : X
ATC / Advisory.TRACON : ZZZ
Aircraft Operator : Corporate
Make Model Name : PC-12
Crew Size.Number Of Crew : 1
Operating Under FAR Part : Part 91
Flight Plan : IFR
Mission : Passenger
Flight Phase : Initial Climb
Route In Use : Vectors
Airspace.Class E : ZZZ

Component

Aircraft Component : Flight Dynamics Navigation and Safety
Aircraft Reference : X
Problem : Malfunctioning

Person

Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Reporter Organization : Corporate
Function.Flight Crew : Single Pilot
Function.Flight Crew : Pilot Flying
Qualification.Flight Crew : Air Transport Pilot (ATP)
Qualification.Flight Crew : Instrument
Qualification.Flight Crew : Multiengine
Experience.Flight Crew.Total : 12958
Experience.Flight Crew.Type : 3454
ASRS Report Number.Accession Number : 2050737

Events

Anomaly.Aircraft Equipment Problem : Less Severe
Anomaly.Inflight Event / Encounter : Weather / Turbulence
Anomaly.Inflight Event / Encounter : CFTT / CFIT
Detector.Automation : Aircraft Other Automation
Detector.Person : Flight Crew
Miss Distance.Horizontal : 2
Miss Distance.Vertical : 1000
When Detected : In-flight
Result.Flight Crew : Took Evasive Action

Assessments

Contributing Factors / Situations : Aircraft
Primary Problem : Aircraft

Narrative: 1

While climbing out of ZZZ and being vectored by ZZZ departure I received several heading, altitude and terrain alerts. My altitude in the PDC Clearance was for 9000' expect FL200 10 min after departure. When given line up and wait on [Runway] XX, tower advised wind was 260/17G22 with Moderate Precipitation over the airport extending 4 miles west. I was then told to turn left to 260 and cleared for takeoff. After takeoff and turning to 260, tower ask to verify heading as 260. At the time I thought that was a little odd. During the climb I went IMC and was picking up turbulence and light icing. I turned-on Prop Deice and boots. I engaged the autopilot around 52-5300 ft. and was turned over to departure. I made my call to departure as 5200' climbing to 9000'. They advised of precip and turbulence for the next 40 miles. I apparently missed a climb to 20000' call as I was distracted by the icing, turbulence and passengers. Going thru about 8200 ft. I was given a left turn to 190. I noticed the autopilot wasn't grabbing the preselected 9000 ft. so I disengaged the autopilot to level off and continued turning to 190. I was then given a 170 heading and I remember starting the turn and from all indications, all was in order until departure kept telling me to keep turning left to 150 and climb. Controller then started giving me altitude and terrain alerts and to continue my left turn and climb. I was starting to get confused because Attitude (bank and pitch) all appeared normal and agreed with the right side except at one point heading showed 210 and verified with controller which further confused me because I had assumed I was already heading 190. I considered switching the left **AHRS** and ADC to #2 as a precaution for false heading and/or airspeed indications but with the turbulence, icing and urgency from the controller never had a chance. Departure finally verified us on a 150 heading and climbing and I remember re-engaging the autopilot with 20000 ft. set in the preselect. Subsequent climb and Nav capture went normal until about :30 into the flight, and level at 220, when both airspeeds on left (Pilot Side) as well as the Standby Attitude Indicator went to 215 KTS and and gave an overspeed warning. Right side was normal at 172 KTS. I verified that Probes switch was on, and CAWs just showed the green Probes De Ice light on. The only indication on a Series 9 PC12 I would have gotten was an orange Static caution which I didn't. I did check the CB's and all were in. OAT was -19 but at that point I was not in any visible moisture. Upon descent both airspeeds returned to normal while descending. Not sure if that was related to the climb out issues but thought that was odd. Landing and return flight were normal. After having time to review the flight, I have several observations and thoughts:

1- After I was on a heading of about 190, the Foreflight Track Log showed a right turn, which would explain why I was on a heading of 210. I don't remember if I was hand flying or on AP at that point. 2-My Foreflight Track Log also shows that I had a left bank with no turn initially at the point where I thought I was turning left to 170 then 150 which was causing me confusion on my heading. 3- I have since observed on this particular airplane that when the autopilot or Yaw Damper is turned off, the rudder kicks to the right, requiring left rudder re-trim. This may explain why it wasn't turning in the left bank (#2 above). The Yaw Damper light on the Autopilot was out. 4- I did consider switching the **AHRS** and ADC's, thinking I was having a heading issue, but on the Garmin TXi's it involves several touch screen settings and isn't that intuitive especially in turbulence. 5- At no point prior to the controller giving me altitude alerts due to terrain, did he ask me why I wasn't climbing out of 9000 ft. I possibly could have started climbing and avoiding the altitude alerts had he ask and clarified my assigned altitude as 20000 ft. earlier. 6- I never received any Terrain Alerts on either the avionics nor on Foreflight on my iPad. 7- At ZZZ they recently changed the initial altitude for departures from 10000 ft. to 9000 ft. The 10000 ft. would have offered more safety in the event such as this, with heading deviations or lost comm, especially near the higher terrain west of ZZZ. 8- I feel training and familiarization has a role to play. There are 3 different types of PC12's (series 9, series 10 and the NG) with 3 different Avionic set ups (old Honeywell DUI's with Garmin GTN 430/503's, newer Garmin TXi's with GTS 650/750s, and NGs with the Honeywell Apex). All can have different attitude displays and autopilots and there isn't much standardization even within the same avionics' packages. The plane I was flying was and older legacy PC12/45 with the newer Garmin TXi's, GTS 650/750 and the older Honeywell autopilot. Annual recurrent simulator training is required by insurance, and to my knowledge, there isn't a simulator offered that has the new Garmin avionics. My most recent recurrent was in the NG but have tried to alternate between the NG and the older legacy but they only offer one with the older Avionics.

Synopsis

PC12 pilot reported multiple instances of heading and altitude deviations possibly due to avionics anomalies.

ACN: 2038880 *(10 of 29)*

Time / Day

Date : 202209
Local Time Of Day : 1201-1800

Place

Locale Reference.ATC Facility : ZLA.ARTCC
State Reference : CA
Relative Position.Distance.Nautical Miles : 100
Altitude.MSL.Single Value : 45000

Environment

Flight Conditions : VMC
Light : Daylight

Aircraft

Reference : X
ATC / Advisory.Center : ZLA
Aircraft Operator : Personal
Make Model Name : EMB-505 / Phenom 300
Crew Size.Number Of Crew : 2
Operating Under FAR Part : Part 91
Flight Plan : IFR
Mission : Personal
Flight Phase : Cruise
Airspace.Class A : ZLA

Component : 1

Aircraft Component : GPS & Other Satellite Navigation
Aircraft Reference : X
Problem : Malfunctioning

Component : 2

Aircraft Component : AHRS/ND
Aircraft Reference : X
Problem : Malfunctioning

Person

Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Reporter Organization : Personal
Function.Flight Crew : Pilot Flying

ASRS Report Number.Accession Number : 2038880
Human Factors : Communication Breakdown
Human Factors : Confusion
Human Factors : Human-Machine Interface
Human Factors : Training / Qualification
Human Factors : Troubleshooting
Human Factors : Workload
Human Factors : Situational Awareness
Communication Breakdown.Party1 : Flight Crew
Communication Breakdown.Party2 : Flight Crew

Events

Anomaly.Aircraft Equipment Problem : Critical
Anomaly.Deviation / Discrepancy - Procedural : Published Material / Policy
Anomaly.Inflight Event / Encounter : Loss Of Aircraft Control
Detector.Automation : Aircraft Other Automation
Detector.Person : Flight Crew
When Detected : In-flight
Result.Aircraft : Equipment Problem Dissipated

Assessments

Contributing Factors / Situations : Aircraft
Contributing Factors / Situations : ATC Equipment / Nav Facility / Buildings
Contributing Factors / Situations : Human Factors
Contributing Factors / Situations : Procedure
Contributing Factors / Situations : Software and Automation
Primary Problem : Software and Automation

Narrative: 1

At FL450 approximately 100 miles north of LAS, a Phenom 300 lost control due to a military radar jamming exercise. Both **AHRS** units dropped off line, as well as the GPS receivers, and the airplane entered an uncontrolled dutch roll. The pilots did not slow down at first, nor did they go down in an attempt to regain control. The event lasted about 20 minutes. With both **AHRS** units off line, of course, the yaw damper and autopilot are unavailable tools, as well as many other related systems. The military either stopped the jamming exercise or the airplane flew out of range of the jamming exercise, and the aircraft systems slowly restored themselves.

Synopsis

Embraer Phenom 300 pilot reported a loss of the Attitude and Heading Reference System resulting in uncontrolled dutch roll at cruise altitude related to a possible military GPS jamming exercise. The pilots did not slow down or reduce altitude, but regained control after a period of time.

ACN: 2016780 *(11 of 29)*

Time / Day

Date : 202307
Local Time Of Day : 1801-2400

Place

Locale Reference.ATC Facility : ZZZ.TRACON
State Reference : US
Altitude.MSL.Single Value : 10500

Environment

Flight Conditions : VMC
Weather Elements / Visibility.Visibility : 10
Light : Night
Ceiling.Single Value : 12000

Aircraft

Reference : X
ATC / Advisory.TRACON : ZZZ
Aircraft Operator : Personal
Make Model Name : Cessna Stationair/Turbo Stationair 6
Crew Size.Number Of Crew : 1
Operating Under FAR Part : Part 91
Flight Plan : None

Mission : Personal
Flight Phase : Cruise

Component : 1

Aircraft Component : AC Generator/Alternator
Aircraft Reference : X
Problem : Failed

Component : 2

Aircraft Component : DC Battery
Problem : Failed

Person

Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Reporter Organization : Personal
Function.Flight Crew : Single Pilot
Qualification.Flight Crew : Instrument
Qualification.Flight Crew : Private
Experience.Flight Crew.Total : 900
Experience.Flight Crew.Last 90 Days : 25
Experience.Flight Crew.Type : 600
ASRS Report Number.Accession Number : 2016780
Human Factors : Workload

Events

Anomaly.Aircraft Equipment Problem : Critical
Detector.Person : Flight Crew
When Detected : In-flight
Result.General : Flight Cancelled / Delayed
Result.Flight Crew : Requested ATC Assistance / Clarification
Result.Flight Crew : Diverted
Result.Air Traffic Control : Provided Assistance

Assessments

Contributing Factors / Situations : Aircraft
Primary Problem : Aircraft

Narrative: 1

While on a VFR flight from ZZZ1 to ZZZ [in] the evening I experienced an alternator failure. I eventually lost all electrical power in the aircraft due to the eventual loss of the battery as well. As a result of the loss of electrical power I also lost a number of flight instruments and radios. I made the decision to continue the flight since I did not believe that there were any good/safe alternative airports in the immediate vicinity, and that since ZZZ2 is my home area I had a good deal of familiarity with the airports there where I knew I would have to make a landing under difficult and less than ideal conditions, i.e. no flaps, since they are electric in this plane, as well as no landing or taxi lights. In addition, I decided to divert from my original destination of ZZZ to the ZZZ2 airport where they had a control tower that is manned 24 hours a day. and very well lit runways. As I approached the ZZZ2 area I was able to establish cell phone communications with a ZZZ Approach controller via Bluetooth connection from my Lightspeed headset to my cell phone. The first thing I did after establishing communications with him was to "officially" [request priority handling], and then appraise him of my situation. As I got into the Class C ZZZ2 airspace the controller gave me the phone number of the Tower controller at the ZZZ2 airport and I called him and established continuous cell phone communications with him. We exchanged position information, and he gave me a clearance to land on Runway XXR. I entered an extended base leg for Runway XXR and safely landed. He then transferred me to the Ground controller whom gave me progressive taxi instructions over to the FBO. I had a number of devices with me in my flight bag (backpack) that I kept on the Co-Pilot's seat next to me that were useful in being able to complete the flight safely. In my opinion the most important of these were a Raspberry PI Statux portable USB powered device with an **AHRS** and GPS chip in it along with a number of USB backup batteries that I could use to power the Statux. I also had two iPads with Foreflight software that were capable of receiving data from the Statux which then provided me with attitude and location information. I also used the USB backup batteries to ensure my cell phone had an adequate charge.

Synopsis

Cessna Stationair pilot reported an alternator failure and subsequent loss of all electrical power and battery during cruise. Pilot continued to destination airport using portable backup communication and navigation devices.

ACN: 2011966 *(12 of 29)*

Time / Day

Date : 202306
Local Time Of Day : 1201-1800

Place

Locale Reference.Airport : IWA.Airport
State Reference : AZ
Relative Position.Angle.Radial : 125
Relative Position.Distance.Nautical Miles : 5
Altitude.MSL.Single Value : 3000

Environment

Flight Conditions : VMC
Weather Elements / Visibility.Visibility : 10
Light : Daylight

Aircraft : 1

Reference : X
ATC / Advisory.Tower : IWA
Aircraft Operator : Personal
Make Model Name : Skyhawk 172/Cutlass 172
Crew Size.Number Of Crew : 2
Operating Under FAR Part : Part 91
Flight Plan : VFR
Mission : Training
Flight Phase : Final Approach
Route In Use.Other
Airspace.Class D : IWA

Aircraft : 2

Reference : Y
ATC / Advisory.Tower : IWA
Aircraft Operator : Military
Make Model Name : Large Transport, Low Wing, 3 Turbojet Eng
Airspace.Class D : IWA

Person

Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Reporter Organization : Personal
Function.Flight Crew : Instructor
Qualification.Flight Crew : Flight Instructor
Qualification.Flight Crew : Instrument
Qualification.Flight Crew : Multiengine
Qualification.Flight Crew : Commercial
Experience.Flight Crew.Total : 654
Experience.Flight Crew.Last 90 Days : 120
Experience.Flight Crew.Type : 576
ASRS Report Number.Accession Number : 2011966
Analyst Callback : Completed

Events

Anomaly.ATC Issue : All Types
Anomaly.Inflight Event / Encounter : Loss Of Aircraft Control
Anomaly.Inflight Event / Encounter : Wake Vortex Encounter
Detector.Person : Flight Crew
When Detected : In-flight
Result.Flight Crew : Regained Aircraft Control

Assessments

Contributing Factors / Situations : Environment - Non Weather Related
Contributing Factors / Situations : Procedure
Primary Problem : Procedure

Narrative: 1

Student and Instructor conducting an IFR cross-country training flight to IWA on an IFR flight plan. Requested the RNAV 30R IWA and subsequently cleared for the approach from Phoenix Approach. During the procedure inbound from WOGMA to WUMIX at roughly 3000~ MSL, IWA Tower instructed Tanker "Heavy" to overfly us on the approach at 1000 ft. above. They then notified us that the tanker would be overflying and to be aware of its wake turbulence. The tanker overflew us by 1000~ ft. and was then cleared to descend, and that the Cessna behind was 1/2 mile back. They would begin their descent, and IWA

Tower would notify us that he was descending and to be aware of wake turbulence. As quick as them saying that, our plane was thrown into a hard 60+ degree uncontrollable left turn followed by several uncontrollable seconds stuck in the wake of the tanker. The wake and the abruptness would knock our aircraft's G1000 **AHRS** system out momentarily until we were eventually able to level out and recover from the upset. The **AHRS** system would come back, and we would go on to land with no other issues and complete the flight.

Callback: 1

Reporter stated the encounter was quite severe and potentially dangerous.

Synopsis

C172 Instructor Pilot reported wake turbulence from a military tanker overflying their aircraft resulted in an upset.

ACN: 1996279 *(13 of 29)*

Time / Day

Date : 202304
Local Time Of Day : 1801-2400

Place

Locale Reference.Airport : ZZZ.Airport
State Reference : US
Altitude.AGL.Single Value : 0

Environment

Flight Conditions : IMC
Light : Night

Aircraft

Reference : X
Aircraft Operator : Fractional
Make Model Name : EMB-505 / Phenom 300
Crew Size.Number Of Crew : 2
Operating Under FAR Part : Part 91
Flight Plan : IFR
Mission : Passenger
Flight Phase : Taxi

Component : 1

Aircraft Component : AHRS/ND
Aircraft Reference : X
Problem : Malfunctioning

Component : 2

Aircraft Component : AHRS/ND
Aircraft Reference : X
Problem : Malfunctioning

Person

Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Reporter Organization : Fractional
Function.Flight Crew : Captain
Function.Flight Crew : Pilot Not Flying
Qualification.Flight Crew : Air Transport Pilot (ATP)
Qualification.Flight Crew : Instrument
Qualification.Flight Crew : Multiengine
ASRS Report Number.Accession Number : 1996279
Human Factors : Troubleshooting
Human Factors : Confusion

Events

Anomaly.Aircraft Equipment Problem : Critical
Anomaly.Deviation / Discrepancy - Procedural : Clearance
Detector.Automation : Aircraft Other Automation
Were Passengers Involved In Event : N
When Detected : Taxi

Result.General : Maintenance Action
Result.General : Flight Cancelled / Delayed
Result.Flight Crew : Returned To Gate
Result.Flight Crew : Requested ATC Assistance / Clarification
Result.Air Traffic Control : Provided Assistance

Assessments

Contributing Factors / Situations : Aircraft
Primary Problem : Aircraft

Narrative: 1

When holding at ILS critical line tower cleared us to taxi to and hold short Runway XX. While taxiing to the hold short we received **AHRS** 1 and 2 fault white advisory CAS messages. At about the same time we received clearance to takeoff. We continued to taxi believing that these advisory messages would clear as we continued to move away from the large metal hanger that we were holding near while at the ILS critical line. I had experienced heading anomalies near this large metal hanger before. Unfortunately these CAS messages did not clear as we aligned for takeoff. We cancelled the takeoff clearance and taxied off the Runway at Tower's instruction. These two advisories cleared as we taxied back to our maintenance facility. We contacted maintenance and operations. After being re-dispatched and our write-up was signed off by maintenance, we attempted to complete this trip. After again holding at the ILS critical line and after having received hold short instructions, we again received the **AHRS** fault messages and this time in addition following yellow **AHRS** Fail and Yaw Damp CAS messages. Before being cleared for takeoff we informed Tower that we needed to return to the ramp because of a maintenance issue. The flight was then cancelled. Crew advisory **AHRS** fault messages that did not clear while aligning on the Runway for takeoff. Cancelled takeoff clearance. Will not assume advisory **AHRS** messages will clear in the future. Will not accept a takeoff clearance until advisory messages have cleared.

Synopsis

EMB-505 Captain reported while taxiing to the hold short line, observing the **AHRS** 1 and 2 Fault white advisory CAS messages. The flight crew returned to the maintenance hangar when the messages did not clear. After maintenance actions, the flight crew taxied back for take off. The flight crew then observed again the **AHRS** fault messages and this time in addition following yellow **AHRS** Fail and Yaw Damp CAS messages. The flight crew returned to the hangar and the flight was cancelled.

ACN: 1965683 *(14 of 29)*

Time / Day

Date : 202301
Local Time Of Day : 1801-2400

Place

Locale Reference.Airport : ZZZ.Airport
State Reference : US
Altitude.MSL.Single Value : 38000

Environment

Flight Conditions : IMC
Weather Elements / Visibility : Icing

Aircraft

Reference : X
ATC / Advisory.Center : ZZZ
Aircraft Operator : Personal
Make Model Name : Premier 1
Crew Size.Number Of Crew : 1
Operating Under FAR Part : Part 91
Flight Plan : IFR
Mission : Personal
Flight Phase : Descent
Route In Use : Direct
Airspace.Class B : ZZZ
Airspace.Class E : ZZZ

Component : 1

Aircraft Component : Air Data Computer
Aircraft Reference : X
Problem : Malfunctioning
Problem : Failed

Component : 2

Aircraft Component : Autoflight System
Problem : Failed

Person

Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Reporter Organization : Personal
Function.Flight Crew : Pilot Flying
Function.Flight Crew : Single Pilot
Qualification.Flight Crew : Commercial
Qualification.Flight Crew : Flight Instructor
Qualification.Flight Crew : Rotorcraft
Qualification.Flight Crew : Instrument
Qualification.Flight Crew : Multiengine
Qualification.Flight Crew : Air Transport Pilot (ATP)
Qualification.Other
Experience.Air Traffic Control.Supervisory : 1745
Experience.Flight Crew.Total : 1017
Experience.Flight Crew.Last 90 Days : 140
Experience.Flight Crew.Type : 106
ASRS Report Number.Accession Number : 1965683
Human Factors : Situational Awareness
Human Factors : Troubleshooting
Human Factors : Workload
Human Factors : Human-Machine Interface

Events

Anomaly.Aircraft Equipment Problem : Critical
Detector.Automation : Aircraft Other Automation
Detector.Person : Flight Crew
Were Passengers Involved In Event : N
When Detected : In-flight
Result.Flight Crew : Diverted
Result.Flight Crew : Overcame Equipment Problem
Result.Flight Crew : Landed in Emergency Condition
Result.Flight Crew : Requested ATC Assistance / Clarification
Result.Air Traffic Control : Issued New Clearance
Result.Air Traffic Control : Provided Assistance

Assessments

Contributing Factors / Situations : Aircraft
Primary Problem : Aircraft

Narrative: 1

Flight from ZZZ1 to ZZZ under IFR flight plan at XAPM central time. Seven soul onboard the plane 1 single pilot Type rated and another pilot type rated observed in the copilot side. We flew at top Altitude FL410, spoke with Center and got the instruction to fly direct to ZZZ2 on the ZZZZ arrival and decent from FL410 TO FL350. ATC ask me what is my Mach speed, I saw 0.73 when I am on tracking. I looked to the copilot PFD and so 0.76 after I notice that my speed indicator on the left pilot side keep decreasing all the way down to stall speed while I am on 90%N1 and descending. Light of IAS on left PFD came also on so I switch to ADC number 2 that looked stable at that time. I run the checklist did as what in it, to switch between the ADC normal to one of the other so I switch to ADC 2. ATC told me to decent to FL240 or FL230. At FL340 I remember I trend on the wing anti ice and engine anti ice because of IMC. After few minutes I lost speed at ADC 2 and the autopilot came off so I hand fly the plane. I [advised] ATC and ask from him if he can give me vectors to an airport with long runway and VFR conditions because I knew all the areas around is IMC and icing condition. I asked ATC to see what he saw as my altitude and he told me to reset my transponder because he do not have indication of my altitude. I reset the transponder and still he did not worked. I flew by the backup ASI and altitude indicator. **AHRS** worked fine, did not had problem with him. ATC cleared me at first to ZZZ3 and then told me ZZZ4 as better ceiling condition so we diverted to ZZZ4. Around 6000 ft. ADC 2 came alive. ATC told me that he have my altitude on the mode C transponder. ADC 1 still did not worked. I got vectors to Runway XXR from ATC, I loaded the ILS XXR on the FMS. Around 2900 ft. we was outside IMC and saw the runway. We landed VFR at ZZZ4. No one was injured and the aircraft did not damage.

Synopsis

Beechcraft Premier 1 pilot reported a loss of both ADCs during descent in IFR conditions. The pilot hand flew the approach using standby instruments and landed.

ACN: 1943321 *(15 of 29)*

Time / Day

Date : 202210
Local Time Of Day : 1201-1800

Place

Locale Reference.ATC Facility : ZZZ.ARTCC
State Reference : US
Relative Position.Distance.Nautical Miles : 15
Altitude.MSL.Single Value : 7500

Environment

Flight Conditions : VMC
Weather Elements / Visibility.Visibility : 10
Light : Daylight
Ceiling.Single Value : 12000

Aircraft

Reference : X
Aircraft Operator : Personal
Make Model Name : Lancair Evolution
Operating Under FAR Part : Part 91
Flight Plan : VFR
Mission : Personal
Flight Phase : Climb
Route In Use : Direct

Component : 1

Aircraft Component : Pitot-Static System
Aircraft Reference : X
Problem : Malfunctioning

Component : 2

Aircraft Component : AHRS/ND
Aircraft Reference : X
Problem : Malfunctioning

Person

Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Reporter Organization : Personal
Function.Flight Crew : Single Pilot
Function.Flight Crew : Pilot Flying
Qualification.Flight Crew : Commercial
Qualification.Flight Crew : Instrument
Qualification.Flight Crew : Multiengine
Experience.Flight Crew.Total : 2500
Experience.Flight Crew.Last 90 Days : 35
Experience.Flight Crew.Type : 300
ASRS Report Number.Accession Number : 1943321

Events

Anomaly.Aircraft Equipment Problem : Critical
Anomaly.Deviation / Discrepancy - Procedural : Clearance
Anomaly.Deviation / Discrepancy - Procedural : Published Material / Policy
Detector.Automation : Aircraft Other Automation
Detector.Person : Flight Crew
Were Passengers Involved In Event : N
When Detected : In-flight
Result.General : Flight Cancelled / Delayed
Result.Flight Crew : Returned To Departure Airport
Result.Flight Crew : Landed in Emergency Condition

Assessments

Contributing Factors / Situations : Aircraft
Primary Problem : Aircraft

Narrative: 1

During initial climb airspeed indication and information was lost on both the primary and backup instrumentation. An issue with the pitot system is suspected. This loss of airspeed input resulted in the loss of the **AHRS**, Autopilot functionality and all airspeed and altitude indication. As both the primary and secondary, backup instrumentation are reliant on the ship's single pitot system, airspeed and altitude information for both primary and secondary instrumentation were lost. A return to the departure airport was initiated and an uneventful precautionary landing was executed.

Synopsis

Pilot reported pitot system malfunctions caused the loss of the **AHRS** and airspeed after take off. Pilot returned to departure airport and landed.

ACN: 1894119 *(16 of 29)*

Time / Day

Date : 202204
Local Time Of Day : 0601-1200

Place

Locale Reference.ATC Facility : ZZZ.ARTCC
State Reference : US
Relative Position.Angle.Radial : 0
Relative Position.Distance.Nautical Miles : 0
Altitude.MSL.Single Value : 35000

Environment

Flight Conditions : VMC
Weather Elements / Visibility.Visibility : 10
Light : Daylight
Ceiling.Single Value : 25000

Aircraft

Reference : X
ATC / Advisory.Center : ZZZ
Aircraft Operator : Corporate
Make Model Name : Citation III, VI, VII (C650)
Crew Size.Number Of Crew : 2
Operating Under FAR Part : Part 91
Flight Plan : IFR
Mission : Passenger
Flight Phase : Climb
Route In Use : Direct
Airspace.Class A : ZZZ

Component

Aircraft Component : AHRS/ND
Aircraft Reference : X
Problem : Malfunctioning

Person

Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Reporter Organization : Corporate
Function.Flight Crew : Pilot Not Flying
Function.Flight Crew : Captain
Function.Flight Crew : Flight Engineer / Second Officer
Qualification.Flight Crew : Flight Instructor
Qualification.Flight Crew : Instrument
Qualification.Flight Crew : Multiengine
Qualification.Flight Crew : Air Transport Pilot (ATP)
Qualification.Other
Experience.Flight Crew.Total : 25000
Experience.Flight Crew.Last 90 Days : 40
Experience.Flight Crew.Type : 3200
ASRS Report Number.Accession Number : 1894119
Human Factors : Troubleshooting

Events

Anomaly.Aircraft Equipment Problem : Critical
Anomaly.Deviation / Discrepancy - Procedural : Clearance
Anomaly.Deviation / Discrepancy - Procedural : Published Material / Policy
Detector.Person : Flight Crew
Were Passengers Involved In Event : N
When Detected : In-flight
Result.General : Maintenance Action
Result.General : Flight Cancelled / Delayed
Result.Flight Crew : Returned To Departure Airport
Result.Flight Crew : Requested ATC Assistance / Clarification
Result.Air Traffic Control : Provided Assistance

Assessments

Contributing Factors / Situations : Aircraft
Primary Problem : Aircraft

Narrative: 1

Climbing through FL350 up to FL 380 near ZZZ1 VOR on an empty leg to pickup our aircraft owners we lost the autopilot, yaw damper, flight directors, and the left **AHRS** (Attitude Heading and Reference System). The **AHRS** failure was responsible for the other failures. Nothing would reset. We informed center of our failures and requested a return to ZZZ2, our departure point. Weather was VFR, no ceiling, and was given a heading to ZZZ2. We didn't request priority handling and were able to navigate on our own back to ZZZ2. We took vectors by ZZZ2 Approach to burn off fuel to get to landing weight and flew a visual approach to a normal landing. Informed our maintenance department.

Synopsis

Captain reported the loss of the left **AHRS** resulted in an air turn back and precautionary landing at departure airport.

ACN: 1861042 *(17 of 29)*

Time / Day

Date : 202112
Local Time Of Day : 0601-1200

Place

Locale Reference.ATC Facility : ZZZ.TRACON
State Reference : US
Relative Position.Distance.Nautical Miles : 10
Altitude.MSL.Single Value : 4000

Environment

Weather Elements / Visibility : Fog
Weather Elements / Visibility.Visibility : 1.5
Ceiling.Single Value : 300

Aircraft

Reference : X
ATC / Advisory.TRACON : ZZZ
Aircraft Operator : Corporate
Make Model Name : Premier 1
Crew Size.Number Of Crew : 1
Operating Under FAR Part : Part 91
Flight Plan : IFR
Mission : Passenger
Flight Phase : Takeoff / Launch
Route In Use : Vectors

Component

Aircraft Component : AHRS/ND
Aircraft Reference : X
Problem : Failed

Person

Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Reporter Organization : Corporate
Function.Flight Crew : Captain

Function.Flight Crew : Single Pilot
Qualification.Flight Crew : Flight Instructor
Qualification.Flight Crew : Instrument
Qualification.Flight Crew : Multiengine
Experience.Flight Crew.Total : 3500
Experience.Flight Crew.Last 90 Days : 150
Experience.Flight Crew.Type : 6
ASRS Report Number.Accession Number : 1861042
Human Factors : Troubleshooting
Human Factors : Human-Machine Interface
Human Factors : Situational Awareness

Events

Anomaly.Aircraft Equipment Problem : Critical
Anomaly.Deviation / Discrepancy - Procedural : Published Material / Policy
Anomaly.Deviation / Discrepancy - Procedural : FAR
Detector.Person : Flight Crew
When Detected : In-flight
Result.Flight Crew : Returned To Departure Airport

Assessments

Contributing Factors / Situations : Aircraft
Contributing Factors / Situations : Weather
Contributing Factors / Situations : Human Factors
Primary Problem : Aircraft

Narrative: 1

Started up the plane to fly to ZZZ1 from ZZZ. I was unaware that Maintenance had just changed the **AHRS** number 1 box out in the aircraft with a new one from Rockwell Collins. I am new to the aircraft as well. **AHRS** lined up well before taxi however during taxi the number one attitude indicator pitched down and to the right. The number 2 **AHRS** also appeared to be pointed strangely further down than normal. This was accompanied with roll and pitch flags on the PFD (Primary Flight Display). I have seen **AHRS** misaligned before on aircraft which can usually be remedied by resetting avionics and letting it realign which I opted to do while holding short of the runway. I coordinated this pause with tower while it realigned. All looked well this time and no more flags. We were cleared for takeoff. At about 300 feet the number one **AHRS** started to point down and right with the attitude indicator. I look over at number 2 which is also pointing slightly down. Flying on the standby attitude gyro I got above the clouds where I then Experienced a full **AHRS** 1 failure. Number 2 still worked but it appeared it was giving me bad information. Using nav info on the number 2 PFD and the standby attitude gauge as well as cross referencing heading with wet compass (which still seemed to work) I flew an ILS back and landed. Moving forward I think we will implement a program between lead pilot, the other pilot and maintenance crew to better advise of changes made since the last flight and for me personally I will make a better risk assessment especially for weather like that (low clouds, fog and low vis) and adhere to that more religiously, especially when instruments act up and are questionable like today and until I become more experienced in the aircraft.

Synopsis

PRM1 pilot reported failure of **AHRS** system after takeoff. The pilot returned to departure airport and landed uneventfully.

ACN: 1803672 *(18 of 29)*

Time / Day

Date : 202104
Local Time Of Day : 1201-1800

Place

Locale Reference.ATC Facility : ZZZ.TRACON
State Reference : US
Altitude.MSL.Single Value : 7000

Environment

Flight Conditions : IMC
Weather Elements / Visibility : Turbulence
Weather Elements / Visibility : Cloudy
Weather Elements / Visibility.Visibility : 10
Light : Daylight
Ceiling.Single Value : 4600

Aircraft

Reference : X
ATC / Advisory.TRACON : ZZZ
Aircraft Operator : Personal
Make Model Name : M-20 F Executive 21
Crew Size.Number Of Crew : 2
Operating Under FAR Part : Part 91
Flight Plan : IFR
Mission : Personal
Flight Phase : Descent
Flight Phase : Cruise
Route In Use : Direct
Airspace.Class E : ZZZ

Component

Aircraft Component : AC Generator/Alternator
Problem : Malfunctioning

Person

Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Reporter Organization : Personal
Function.Flight Crew : Instructor
Function.Flight Crew : Pilot Flying
Qualification.Flight Crew : Flight Instructor
Qualification.Flight Crew : Instrument
Qualification.Flight Crew : Multiengine
Qualification.Flight Crew : Air Transport Pilot (ATP)
Experience.Flight Crew.Total : 4764
Experience.Flight Crew.Last 90 Days : 90
Experience.Flight Crew.Type : 127
ASRS Report Number.Accession Number : 1803672
Human Factors : Communication Breakdown
Human Factors : Troubleshooting
Communication Breakdown.Party1 : Flight Crew
Communication Breakdown.Party2 : ATC

Events

Anomaly.Aircraft Equipment Problem : Critical
Anomaly.Deviation / Discrepancy - Procedural : Published Material / Policy
Detector.Person : Flight Crew
Were Passengers Involved In Event : N
When Detected : In-flight
Result.General : Flight Cancelled / Delayed
Result.General : Maintenance Action
Result.Flight Crew : Diverted
Result.Flight Crew : Requested ATC Assistance / Clarification
Result.Flight Crew : Landed in Emergency Condition
Result.Flight Crew : Overcame Equipment Problem
Result.Air Traffic Control : Provided Assistance

Assessments

Contributing Factors / Situations : Aircraft
Primary Problem : Aircraft

Narrative: 1

While on an IFR Flight from ZZZ to ZZZ1 in cruise flight in IMC conditions, the aircraft experienced a total loss of electrical power. Aircraft was being piloted by a Private Pilot receiving instrument instruction from me. The STEC 60 autopilot was engaged and managing the both navigation and altitude control. When the electrical failure occurred, the autopilot disengaged and aircraft began a descending turn that was recognized by the avionics powering down and the airspeed starting to increase. As the Instructor, I announced that I had the controls and initiated partial panel IMC operations. Focusing on the principals of Aviate, Navigate and Communicate, I began controlling the airspeed to maintain level flight and shallowed the angle of bank until I achieved what appeared to be level flight after approximately 150 degrees of heading change. The Pilot (Instrument Student) asked if he should get the iPad and the **AHRS** up from ForeFlight which I agreed was the right next step. We confirmed that we were in level flight and executed a shallow bank to reestablish the desired easterly course using the partial panel information and continued to backup with ForeFlight. Next, I called for the pilot to turn off the Master switch and then turn it back on to reestablish the main power. Then I called for him to activate the Avionics Master switch which reestablished all of the avionics. The alternator was not restored so we shed the electrical load and choose not to change anything else since we had the flight instruments and the communications/transponder operational. We confirmed that all of circuit breakers were in and none were popped. We were able to update ATC on the situation and we entered VMC

conditions after about 5 minutes. All systems were operational except the alternator. We worked with ATC to change the clearance to ZZZ2 for support and did not feel that we needed emergency equipment when they asked. I also asked for a phone number to ZZZ3 Center for ATC in case we lost communication or electrical again. The weather at ZZZ2 was: [Date] XA:53 METAR ZZZ2 [Date]XA53Z 20008KT 10SM OVC032 11/07 A2988 [Date] XA:53 METAR ZZZ2 [Date]XA53Z 19006KT 10SM FEW022 SCT036 OVC044 12/07 A2987 We maintained visual flight control for the rest of the flight to ZZZ2 in case we lost electrical again. We had been cleared direct to ZZZZZ for the approach to Runway XX. We did lose electrical/communication again due to the battery discharging just before we arrived at ZZZ1. We called ZZZ3 Center on the cell phone, they helped manage us and gave us a phone number to the ZZZ2 Tower. We advised ZZZ2 we had the field in sight and asked for clearance to land. The rest of the flight was uneventful and ATC gave us progressive instructions to the FBO via the cell phone. At the FBO, the I removed the cowling, visually inspected the major electrical components and verified that there were no loose wires or indicated damage to the components. Maintenance was called but none was readily available and no one seemed to have a 12V Auxiliary Power Unit. I powered up the aircraft to see if all of the systems would come back online - all systems came back online including the alternator. An assessment was made that all systems were operational and the next two legs of the flight would be performed in Visual Flight Conditions. Additional Info: The aircraft was just purchased and was being flown by the new owner and the instructor back from ZZZ4 to ZZZ5. The pre-buy inspection had been completed the week prior at a Mooney Service Center in [name removed] State. There were no known or observed issues with the electrical system. ATC was outstanding in their assistance, handling and communication.

Synopsis

Flight Instructor reported that the loss of all electrical power resulted in a diversion, and a precautionary emergency landing.

ACN: 1710081 *(19 of 29)*

Time / Day

Date : 201912
Local Time Of Day : 1201-1800

Place

Locale Reference.ATC Facility : ZZZ.ARTCC
State Reference : US
Altitude.MSL.Single Value : 39900

Environment

Flight Conditions : VMC
Light : Daylight

Aircraft

Reference : X
ATC / Advisory.Center : ZZZ
Aircraft Operator : Corporate
Make Model Name : Beechjet 400
Crew Size.Number Of Crew : 2
Operating Under FAR Part : Part 91
Flight Plan : IFR
Mission : Passenger
Flight Phase : Climb
Route In Use : Direct
Airspace.Class A : ZZZ

Component

Aircraft Component : Stall Warning System
Aircraft Reference : X
Problem : Malfunctioning

Person : 1

Reference : 1
Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Reporter Organization : Corporate
Function.Flight Crew : Captain
Function.Flight Crew : Pilot Flying
Qualification.Flight Crew : Multiengine
Qualification.Flight Crew : Air Transport Pilot (ATP)
Qualification.Flight Crew : Flight Instructor
Qualification.Flight Crew : Instrument
Experience.Flight Crew.Total : 9772
Experience.Flight Crew.Last 90 Days : 72

Experience.Flight Crew.Type : 237
ASRS Report Number.Accession Number : 1710081
Human Factors : Human-Machine Interface

Person : 2

Reference : 2
Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Reporter Organization : Corporate
Function.Flight Crew : Pilot Not Flying
Function.Flight Crew : First Officer
Qualification.Flight Crew : Air Transport Pilot (ATP)
Qualification.Flight Crew : Flight Instructor
Qualification.Flight Crew : Multiengine
Qualification.Flight Crew : Instrument
ASRS Report Number.Accession Number : 1710109
Human Factors : Human-Machine Interface

Events

Anomaly.Aircraft Equipment Problem : Critical
Anomaly.Deviation - Altitude : Excursion From Assigned Altitude
Anomaly.Deviation / Discrepancy - Procedural : Published Material / Policy
Detector.Automation : Aircraft Other Automation
Detector.Person : Flight Crew
When Detected : In-flight
Result.Flight Crew : FLC Overrode Automation
Result.Flight Crew : Regained Aircraft Control

Assessments

Contributing Factors / Situations : Aircraft
Primary Problem : Aircraft

Narrative: 1

Leveling at FL400, Stall Warning horn, stall warning light and stick shaker activation occurred. Immediately, added full power and disconnected autopilot for stall recovery procedures and gently lowered the nose to recover. In doing so, lost approximately 600 feet from assigned FL400 but had not locked with autopilot "alts cap" yet.

Immediately advised ATC since the AOA on the pilot's side was at .25 in the green and ISA at +3. Airspeed was not noted since on the left side since I was focused on AOA in the green and we were in a full stall activation and should not be per the computer information. We were getting misinformation by two separate systems and was confusing to diagnose so quickly but priority was to fly the plane and recover from the stall activation. Co-pilot stated they looked at their airspeed at the moment it happened and stated they saw 165 KIAS.

We immediately asked for a lower altitude and return back to the departing airport of ZZZ and land. We were given initial vectors and had the airport visually and landed without further control or stall activation.

Once on the ground and about one hour later on ground power unit (GPU), went out to the plane and saw the co-pilot side **AHRS** System failed with red flags. During flight, no flags or failure conditions noted and all systems were working.

Good decision for quick stall recovery within 1 minute of stall activation.

Crew had good rest and monitoring the aircraft.

Crew discussed checklist but nothing in the checklist for this scenario exists and used the checklist for descent, approach and landing.

We did not activate emergency services at the airport on landing since we had full control authority and no anomalies.

Narrative: 2

While airplane was leveling off at ATC assigned altitude of FL400, stall warning horn, stall warning light and stick shaker activation occurred.

PIC disconnected autopilot, applied full power and lowered nose. We lost approximately 600 feet doing so. Control of the aircraft was regained promptly.

PIC advised ATC immediately and decided to divert back to ZZZ, as we knew the weather was VFR all the way there.

I checked airspeed during the warnings and saw it bleeding down and remember seeing 165 indicated.

We requested lower altitude and flew back safely to ZZZ without any other issues. We completed all our usual checklists and

landed safely.

We did not activate emergency services at the airport as we had full control of the aircraft and no abnormalities.

About an hour later on the ground the PIC was on GPU and co-pilot side **AHRS** system was failed with red flags. We did not get any flags or failure or any alerts during flight.

I think this failure was handled properly and safely with priority on aircraft control.

Synopsis

BE-400 flight crew reported multiple stall warning indications activated while in cruise. The crew recovered from the stall promptly, noting a disagreement in information from two systems.

ACN: 1683855 *(20 of 29)*

Time / Day

Date : 201909
Local Time Of Day : 0001-0600

Place

Locale Reference.ATC Facility : ZAB.ARTCC
State Reference : NM
Relative Position.Angle.Radial : 090
Relative Position.Distance.Nautical Miles : 170
Altitude.MSL.Single Value : 40000

Environment

Flight Conditions : Mixed
Light : Daylight

Aircraft

Reference : X
ATC / Advisory.Center : ZAB
Aircraft Operator : Corporate
Make Model Name : Eclipse 500
Crew Size.Number Of Crew : 2
Operating Under FAR Part : Part 91
Flight Plan : IFR
Flight Phase : Cruise
Route In Use : Direct
Airspace.Class A : ZAB

Component

Aircraft Component : GPS & Other Satellite Navigation
Aircraft Reference : X
Problem : Malfunctioning

Person

Reference : 1
Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Reporter Organization : Corporate
Function.Flight Crew : Captain
Function.Flight Crew : Pilot Flying
Qualification.Flight Crew : Instrument
Qualification.Flight Crew : Air Transport Pilot (ATP)
Qualification.Flight Crew : Flight Instructor
Qualification.Flight Crew : Multiengine
Experience.Flight Crew.Total : 11000
Experience.Flight Crew.Last 90 Days : 150
Experience.Flight Crew.Type : 200
ASRS Report Number.Accession Number : 1683855
Human Factors : Situational Awareness

Events

Anomaly.Aircraft Equipment Problem : Less Severe
Detector.Person : Flight Crew

When Detected : In-flight
Result.Flight Crew : Overcame Equipment Problem

Assessments

Contributing Factors / Situations : Aircraft
Contributing Factors / Situations : Airspace Structure
Contributing Factors / Situations : Environment - Non Weather Related
Contributing Factors / Situations : Human Factors
Contributing Factors / Situations : Procedure
Primary Problem : Aircraft

Narrative: 1

This happened to me again on my return flight. Flying at FL410 I encountered a loss of GPS signal as a result of jamming. On the ATC frequency there were numerous aircraft that were similarly affected. All aircraft had to resort to flying by heading, or an alternative means of navigation. In some cases aircraft had to descend since their **AHRS** require GPS signals. In my case the disruption to navigation lasted nearly an hour. This extremely frequent jamming of critical GPS navigation is a significant threat to aviation safety. This affects all aircraft and could result in critical altitude changes for aircraft that are required to descend to lower altitude when losing a GPS signal. If can aircraft has to descend to a lower altitude it can have a significant impact on its range and could result in a diversion. Most modern aircraft rely solely on GPS not only for navigation signals in cruise, but also to determine range, fuel remaining, and other critical aspects of flight. In addition this disruption also impact instrument approach procedures. Since the FAA is deprecating VORs, NDBs, and associated approaches, we are becoming dependent upon an unreliable navigation system. Imagine an aircraft on an RNAV approach in IMC and it loses the GPS signal. Not only could it not continue to descend on the approach - the pilot would have no method to execute a missed approach. This jamming has to end.

Synopsis

Eclipse pilot reported experiencing GPS jamming that lasted an hour.

ACN: 1683854 *(21 of 29)*

Time / Day

Date : 201909
Local Time Of Day : 0001-0600

Place

Locale Reference.ATC Facility : ZAB.ARTCC
State Reference : NM
Relative Position.Distance.Nautical Miles : 170
Altitude.MSL.Single Value : 41000

Environment

Flight Conditions : Mixed

Aircraft

Reference : X
ATC / Advisory.Center : ZAB
Aircraft Operator : Corporate
Make Model Name : Eclipse 500
Crew Size.Number Of Crew : 2
Operating Under FAR Part : Part 91
Flight Plan : IFR
Flight Phase : Cruise
Route In Use : Direct
Airspace.Class A : ZAB

Component

Aircraft Component : GPS & Other Satellite Navigation
Aircraft Reference : X
Problem : Malfunctioning

Person

Reference : 1
Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Reporter Organization : Corporate
Function.Flight Crew : Captain

Qualification.Flight Crew : Instrument
Qualification.Flight Crew : Air Transport Pilot (ATP)
Qualification.Flight Crew : Flight Instructor
Qualification.Flight Crew : Multiengine
Experience.Flight Crew.Total : 11000
Experience.Flight Crew.Last 90 Days : 150
Experience.Flight Crew.Type : 200
ASRS Report Number.Accession Number : 1683854
Human Factors : Situational Awareness

Events

Anomaly.Aircraft Equipment Problem : Less Severe
Detector.Person : Flight Crew
When Detected : In-flight
Result.Flight Crew : Overcame Equipment Problem

Assessments

Contributing Factors / Situations : Aircraft
Contributing Factors / Situations : Airspace Structure
Contributing Factors / Situations : Environment - Non Weather Related
Contributing Factors / Situations : Human Factors
Contributing Factors / Situations : Procedure
Primary Problem : Aircraft

Narrative: 1

Flying at FL410, I encountered a loss of GPS signal as a result of jamming. On the ATC frequency there were numerous aircraft that were similarly affected. All aircraft had to resort to flying by heading, or an alternative means of navigation. In some cases aircraft had to descend since their **AHRS** require GPS signals. In my case the disruption to navigation lasted nearly an hour. This extremely frequent jamming of critical GPS navigation is a significant threat to aviation safety. This affects all aircraft and could result in critical altitude changes for aircraft that are required to descend to lower altitude when losing a GPS signal. If can aircraft has to descend to a lower altitude it can have a significant impact on its range and could result in a diversion. Most modern aircraft rely solely on GPS not only for navigation signals in cruise, but also to determine range, fuel remaining, and other critical aspects of flight. In addition this disruption also impact instrument approach procedures. Since the FAA is deprecating VORs, NDBs, and associated approaches, we are becoming dependent upon an unreliable navigation system. Imagine an aircraft on an RNAV approach in IMC and it loses the GPS signal. Not only could it not continue to descend on the approach - the pilot would have no method to execute a missed approach. This jamming has to end.

Synopsis

Eclipse pilot reported experiencing GPS jamming during cruise that lasted for an hour.

ACN: 1638902 *(22 of 29)*

Time / Day

Date : 201904
Local Time Of Day : 1801-2400

Place

Locale Reference.Airport : ZZZ.Airport
State Reference : US
Relative Position.Angle.Radial : 251
Relative Position.Distance.Nautical Miles : 60
Altitude.MSL.Single Value : 10500

Environment

Flight Conditions : VMC
Weather Elements / Visibility.Visibility : 10
Light : Daylight

Aircraft

Reference : X
Aircraft Operator : Personal
Make Model Name : Amateur/Home Built/Experimental
Crew Size.Number Of Crew : 1
Operating Under FAR Part : Part 91
Flight Plan : VFR
Mission : Personal

Flight Phase : Cruise
Route In Use : Direct
Airspace.Class E : ZZZ

Component

Aircraft Component : PFD
Aircraft Reference : X
Problem : Failed

Person

Reference : 1
Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Reporter Organization : Personal
Function.Flight Crew : Single Pilot
Qualification.Flight Crew : Private
Qualification.Flight Crew : Instrument
Experience.Flight Crew.Total : 935
Experience.Flight Crew.Last 90 Days : 6
Experience.Flight Crew.Type : 21
ASRS Report Number.Accession Number : 1638902
Human Factors : Human-Machine Interface
Human Factors : Situational Awareness
Human Factors : Workload
Human Factors : Distraction

Events

Anomaly.Aircraft Equipment Problem : Critical
Detector.Person : Flight Crew
When Detected : In-flight
Result.Flight Crew : Overcame Equipment Problem
Result.Flight Crew : Diverted

Assessments

Contributing Factors / Situations : Aircraft
Primary Problem : Aircraft

Narrative: 1

While in cruise flight as part of a flight of two aircraft in loose formation, on a direct route from ZZZ, main instrument display, Dynon EFIS-D100 failed going blank resulting in loss of multiple flight instruments including airspeed, altitude, magnetic compass, turn rate, slip/skid ball, bank and vertical speed. I attempted to reset the system first by resetting the circuit breaker and then by cycling the avionics power with no joy. Backup **AHRS** was available via an iPad running ForeFlight with a Stratus 2.

Given the location over mountainous terrain and a strong tailwind, I elected to continue the flight west to clear the mountains in excellent VMC with the aircraft in loose formation validating altitude and airspeed data. The flight terminated uneventfully at ZZZ1 without ever recovering the D-100. This aircraft is equipped with both a D-100 and a D-120 which gives the illusion of redundancy, however once the D-100 went down, all **AHRS** information was lost on the D-120 as well even though engine information continued to display.

The combination of ForeFlight and the Stratus 2 with full **AHRS** turned out to be an excellent and reliable backup with very accurate altitude and groundspeed information provided, though I will be having a backup system installed to provide full redundancy for airspeed and barometric altitude.

Synopsis

Kitfox pilot in formation flight reported primary instrument failure over mountainous terrain. Pilot used electronic flight bag as a backup navigation device.

ACN: 1540090 *(23 of 29)*

Time / Day

Date : 201805
Local Time Of Day : 1201-1800

Place

Locale Reference.Airport : ZZZ.Airport
State Reference : US

Altitude.AGL.Single Value : 0

Environment

Flight Conditions : VMC
Light : Daylight

Aircraft

Reference : X
ATC / Advisory.Tower : ZZZ
Make Model Name : Embraer Legacy 450/500
Crew Size.Number Of Crew : 2
Operating Under FAR Part : Part 91
Flight Plan : IFR
Flight Phase : Takeoff / Launch
Airspace.Class D : ZZZ

Component : 1

Aircraft Component : FCC (Flight Control Computer)
Aircraft Reference : X
Problem : Failed

Component : 2

Aircraft Component : AHRS/ND
Aircraft Reference : X
Problem : Failed

Person

Reference : 1
Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Function.Flight Crew : Captain
Function.Flight Crew : Pilot Not Flying
Qualification.Flight Crew : Instrument
Qualification.Flight Crew : Air Transport Pilot (ATP)
Qualification.Flight Crew : Multiengine
ASRS Report Number.Accession Number : 1540090
Human Factors : Situational Awareness
Human Factors : Troubleshooting
Human Factors : Workload
Human Factors : Distraction

Events

Anomaly.Aircraft Equipment Problem : Critical
Detector.Person : Flight Crew
When Detected : In-flight
Result.General : Maintenance Action
Result.Flight Crew : Diverted
Result.Flight Crew : Requested ATC Assistance / Clarification
Result.Flight Crew : Overcame Equipment Problem
Result.Air Traffic Control : Provided Assistance

Assessments

Contributing Factors / Situations : Aircraft
Primary Problem : Aircraft

Narrative: 1

The flight from ZZZ to ZZZ1 was briefed to be standard flight. From the briefing prior to the flight, everything seemed ordinary. No indications on the flight deck of any pending malfunctions. FMS Number 2 was MELed one day prior but had no bearing on the Flight Control Computers and **AHRS** (Attitude and Heading Reference System) malfunctioning simultaneously. [First Officer (FO)] was the pilot flying, from the right seat, I was the pilot monitoring from the left seat. All call-outs during the takeoff roll were standard company calls. After I heard the malfunction chime, read that the red Flt Controls Normal Mode Fail message was displayed on the EICAS, glanced our IAS which indicated between V1 and Vr called continue then followed through with the First Officer to assure that [the aircraft] rotated smoothly to 15 plus degrees pitch [and] hold the runway heading, called positive rate then put the gear up, watched the FO use manual trim to help lower the nose after 400 feet.

The FO verbally confirmed that we were in Direct Mode and I agreed, pointing out the illuminated Normal button. I reached for the checklist in the slot at the rear of the pedestal, [in] order to prepare for the running the checklist prior to landing but it slipped from my hand and slid 3/4 of the way down the aisle. I decided to remain in the cockpit after the FO and I decided that the only item on the checklist to be examined was the possibility of pushing the Normal. We collectively decided against

it, as we were not convinced that this wouldn't have a negative outcome for the safety of the flight, especially since if the button was pushed so very low to the ground, [about] 1,900 feet AGL, then became uncontrollable if we de-selected it but it malfunctioned then we wouldn't have room to recover from and unusual pitch attitude. Better safe than sorry! Flying in Direct Mode proved to be wise as we learned that both flight computers (FCC1 & FCC2 as well as **AHRS** 1&2 had failed simultaneously). I coordinated the ILS with ZZZ2 approach control, and acquired the field on a wide 45 to the touchdown point, conversed with the FO about "going visual." The FO agreed, so I called the field and observed the FO join the localizer slightly inside the final approach fix on speed, and glide slope.

We conversed that flaps 3 was a good decision; less pitch variances close to the ground, thus less chance for destabilization. FO called for the approach speed, I said use 140 kts, which turned out to Ref +10. The FO rounded out and flared making a small adjustment for drift in the crosswind, and braking upon touchdown along with deploying reversers. I noticed the FO was holding the nose off. So I added a small amount of forward stick, achieving the desired outcome of establishing maximum braking with mains and nose wheel on ground and said I was doing this in order to maximize breaking efficiency. We turned off at taxiway X, towards the FBO ramp, declared to ATC that we didn't need any more assistance, when queried. I did the after landing flows/checklist and then shutdown flow and checklist. Followed by a short positive debrief with the FO, called Dispatch and Maintenance Control, took the Chief Pilot's call, called Dispatch back for a verbal incident report.

Discovered with the mechanic, that the fault codes told of the double FCC and **AHRS** failures. EICAS Flt Control Mode Fail message (red message), uncommanded Direct Mode for flight controls engaged (replacing malfunctioning Normal Mode), EICAS Flt Control No Dispatch (amber message) displayed after 400 feet AGL. FCC1, FCC2; **AHRS**1 & **AHRS**2 failed simultaneously during climb out.

Synopsis

Embraer Legacy 550 Captain reported the simultaneous failure of both Flight Control Computers (FCC), and both Attitude & Heading Reference System (**AHRS**) computers immediately after takeoff, resulting in the aircraft reverting the Direct Mode for operating of the flight controls causing the aircraft to divert to a suitable airport.

ACN: 1539957 *(24 of 29)*

Time / Day

Date : 201805
Local Time Of Day : 1201-1800

Place

Locale Reference.Airport : ZZZ.Airport
State Reference : US
Altitude.AGL.Single Value : 0

Environment

Flight Conditions : VMC
Light : Daylight

Aircraft

Reference : X
ATC / Advisory.Tower : ZZZ
Aircraft Operator : Fractional
Make Model Name : EMB-505 / Phenom 300
Crew Size.Number Of Crew : 2
Operating Under FAR Part : Part 91
Flight Plan : IFR
Mission : Passenger
Flight Phase : Takeoff / Launch
Airspace.Class D : ZZZ

Component

Aircraft Component : FCC (Flight Control Computer)
Aircraft Reference : X
Problem : Failed

Person

Reference : 1
Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Reporter Organization : Fractional
Function.Flight Crew : Pilot Flying
Function.Flight Crew : First Officer
Qualification.Flight Crew : Air Transport Pilot (ATP)

Qualification.Flight Crew : Instrument
Qualification.Flight Crew : Multiengine
ASRS Report Number.Accession Number : 1539957
Human Factors : Troubleshooting

Events

Anomaly.Aircraft Equipment Problem : Less Severe
Detector.Person : Flight Crew
When Detected : In-flight
Result.Flight Crew : Landed As Precaution
Result.Flight Crew : Diverted

Assessments

Contributing Factors / Situations : Aircraft
Primary Problem : Aircraft

Narrative: 1

The flight started as a normal flight. Checklists and flows were run like every other flight. No indications of anything abnormal was noticed prior to taking the runway for takeoff. During takeoff roll, between V1 and VR speeds the red ICAS message FLT CTRL Normal Mode Fail illuminated. I briefly looked over to see what message was displayed. [Captain] said continue. I did not actually read the message. I continued to fly the aircraft maintaining positive control. I pitched as normal to above 15 degrees of nose up. The gear and flap were brought up. I noticed at this time that the aircraft was in direct mode because I had hold forward on the side stick to keep the nose from continuing to pitch up and it was requiring extra pressure while trying to pitch forward. We were assigned 2,000 feet and I started to pitch down for that. I communicated with [Captain] that we were definitely in Direct mode. [The Captain] confirmed this by looking down at the normal mode button that was illuminated red. I used manual pitch trim on the center console and leveled at 2,000 feet on assigned heading with positive aircraft control. We switched to Departure frequency and checked in. They issued a higher altitude and a turn to a fix. [Captain advised ATC] at that time stating we wanted to maintain our altitude and go to ZZZ for the longest runway into the wind. We discussed running the checklist, but it had slipped out of [the Captain's] hand during the initial steep climb after takeoff. Being familiar with the checklist from training, we then discussed NOT pushing the normal mode button to return the aircraft to the FCC (Flight Control Computer) computers. We had FMS 2 MELed and did not want to risk allowing the FCC's to make the situation worse while so low to the ground. (After landing we discovered both FCC 1 an FCC 2 and both **AHRS** (Altitude Heading Reference System) 1 and **AHRS** 2 all failed simultaneously) While abnormal, we had known positive aircraft control and did not want to jeopardize this by pushing the flight controls normal mode button. We continued with radar vectors to ILS 11 at ZZZ. (Previously briefed as a divert airfield.) We acquired the airport on left downwind in VMC conditions and so maneuvered to the final and made a normal approach and landing using flaps 3, because it was stable, and I didn't want to manually change pitch trim. We touched down normally. I applied the brakes after touchdown and was letting the nose down slowly. [Captain] pushed forward on the side stick and we got a dual input oral warning. I believe [the Captain] was just being sure that the aircraft was coming to a stop. The nose wheel touched down smoothly. Moderate braking was applied and thrust reversers were powered bringing us to as stop by taxiway C. We slowly taxied down C and parked the aircraft on the [FBO] ramp. We shut the aircraft down normally and left the APU running. [Captain] then began calling Scheduling and Maintenance to explain what happened.

Synopsis

Phenom 300 First Officer reported failure of the overall trim system shortly after rotation. Flight diverted to a more suitable nearby field and landed normally.

ACN: 1408606 *(25 of 29)*

Time / Day

Date : 201612
Local Time Of Day : 1801-2400

Place

Locale Reference.Airport : ZZZ.Airport
State Reference : US

Environment

Flight Conditions : VMC
Light : Dusk

Aircraft

Reference : X
Make Model Name : Cessna Citation Sovereign (C680)
Crew Size.Number Of Crew : 2
Operating Under FAR Part : Part 91
Flight Plan : IFR

Component

Aircraft Component : AHRS/ND
Aircraft Reference : X
Problem : Malfunctioning

Person

Reference : 1
Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Function.Flight Crew : Captain
Function.Flight Crew : Pilot Flying
Qualification.Flight Crew : Air Transport Pilot (ATP)
ASRS Report Number.Accession Number : 1408606

Events

Anomaly.Aircraft Equipment Problem : Less Severe
Anomaly.Deviation / Discrepancy - Procedural : Published Material / Policy
Anomaly.Deviation / Discrepancy - Procedural : Maintenance
Detector.Person : Flight Crew
When Detected : In-flight
Result.General : Maintenance Action

Assessments

Contributing Factors / Situations : Procedure
Contributing Factors / Situations : Human Factors
Primary Problem : Procedure

Narrative: 1

We picked up the aircraft after it was returned to service for a repeat write up involving **AHRS** number 2 failing to initialize. We were in tune to making sure that the **AHRS** operated normally during preflight and it did. During this day we were assigned a series of flights. On the first leg during the climb out both channels of the autopilot and Yaw Damper (YD) kicked off during the climb out, but they immediately reset without action from the crew and we accepted the fault as spurious and continued without incident. On the second leg we received the autopilot/yaw damper fail messages during the high speed portion of the takeoff roll and again they went away. During the climb out at a high pitch attitude the autopilot start pitching down nose and I disconnected it and again the autopilot/yaw damper fail messages posted for a short time. We decided something was not right and upon arrival we deferred and secured the autopilot and yaw damper systems.

[Maintenance] asked us to move the airplane to [a maintenance center] to have [maintenance] performed on the autopilot/yaw damper system. During the flight we received a pitch miscompare between the Captain's and First Officer's attitude displays. The First Officer's display was about five degrees higher than the Captain's and the standby so it was easy to identify the problem and fly the airplane. As soon as we got to cruise the miscompare went away and did not come back the remainder of the flight.

Upon arrival at the service center we asked to speak to an avionics technician as these problems seemed related to one another. One came out and we explained all of the things we observed. He took note of that and opened the nose cowl and immediately identified the problem, the number 2 **AHRS** unit was not secure in its rack and was easily moved with one finger. He said that all of the indications we received were a result of this issue.

The **AHRS** units are not part of our preflight checks, but going forward I will certainly look at them especially when receiving the aircraft from [maintenance] on the **AHRS** itself. It makes sense that an **AHRS** unit would not give accurate info if it is not secure in its rack. When we were accelerating clearly the **AHRS** unit was shifting in its mount and causing different abnormal indications, but when we were in non-accelerated flight the **AHRS** unit went back into its normal spot leading to normal indications.

The Captain further discussed the issues with [Maintenance] Control they decided that the two items were related and no additional info for [maintenance] was needed. Of note, **AHRS** number 2 was not safety wired and number 1 was.

I would suggest reviewing the [maintenance] manual procedures, Cessna advised that the aircraft must be leveled after the **AHRS** units are adjusted and it does not appear that all of the procedures were followed by the previous vendor.

Synopsis

CE-680 Captain reported experiencing multiple autopilot/yaw damper anomalies that were later traced to the #2 **AHRS** unit not being properly secured in its rack by the previous maintenance personnel.

ACN: 1398464 *(26 of 29)*

Time / Day

Date : 201610
Local Time Of Day : 1201-1800

Place

Locale Reference.ATC Facility : ZZZ.ARTCC
State Reference : US
Altitude.MSL.Single Value : 23000

Environment

Flight Conditions : IMC
Weather Elements / Visibility : Icing
Light : Dusk

Aircraft

Reference : X
ATC / Advisory.Center : ZZZ
Aircraft Operator : Personal
Make Model Name : PA-46 Malibu/Malibu Mirage/Malibu Matrix
Crew Size.Number Of Crew : 1
Operating Under FAR Part : Part 91
Flight Plan : IFR
Mission : Personal
Flight Phase : Climb
Airspace.Class A : ZZZ

Component

Aircraft Component : Electrical Power
Aircraft Reference : X
Problem : Failed

Person

Reference : 1
Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Reporter Organization : Personal
Function.Flight Crew : Pilot Flying
Function.Flight Crew : Single Pilot
Qualification.Flight Crew : Multiengine
Qualification.Flight Crew : Instrument
Qualification.Flight Crew : Commercial
Experience.Flight Crew.Total : 1500
Experience.Flight Crew.Last 90 Days : 55
Experience.Flight Crew.Type : 550
ASRS Report Number.Accession Number : 1398464
Human Factors : Situational Awareness
Human Factors : Training / Qualification

Events

Anomaly.Aircraft Equipment Problem : Critical
Anomaly.Inflight Event / Encounter : Weather / Turbulence
Detector.Person : Flight Crew
When Detected : In-flight
Result.Flight Crew : Became Reoriented
Result.Flight Crew : Overcame Equipment Problem

Assessments

Contributing Factors / Situations : Aircraft
Contributing Factors / Situations : Human Factors
Contributing Factors / Situations : Weather
Primary Problem : Human Factors

Narrative: 1

Climbing to cruising altitude at dusk (climbing back into the sunset, but IMC in clouds), the aircraft was passing through FL230 on the way to FL260, the aircraft suffered a dual main bus breaker failure. The plane was climbing through layers of IMC clouds, light ice, accordingly the electrical anti-ice/de-ice systems were on including windshield heat (always on above FL180), pitot heat (always on for all flights), stall warning heat, prop heat, and cabin electrical auxiliary heat for windshield defog. Systems on for much of the climb, but at some point either transient voltage greater than the dual 80 amp breakers could handle, or resistance on one breaker increased. Regardless of the cause, the result was a failure of numerous systems tied to the main bus including: Pilot's PFD/MFD (Garmin G500), Copilot Sandel EHSI failed, copilot electric Attitude Indicator

(AI) probably spooled down (unclear and didn't check), all cabin illumination, wing to header tank fuel pumps, header tank to PT6A electrical boost pump, annunciator panel, all engine instruments (torque/temperature, fuel flow/pressure/quantity, oil temperature/pressure, vacuum pressure), all of the above mentioned anti/de-ice electrical systems, de-ice boot activation switch, p3 heat, and a bunch more that is not relevant to the situation. Dual GPS Nav/Comms (Avidyne IFD 540/440 with large map displays), radar, XM weather, traffic, transponder, and generator/battery volts/amp indicator continued to work worked. (Since the Nav/Comm and transponders were working, ATC communication was maintained and until I noted the issue to them, they were unaware of any problems.) The autopilot control head was illuminated, but without the **AHRS** from the G500, it wasn't functional.

The pilot's backup instruments (airspeed, vacuum driven AI, and altimeter) were all functioning. Using the backup instruments, I maintained positive control of the aircraft while splitting my time to troubleshoot the problem. I advised ATC that I might need vectors to the nearest best weather, however, I did not want to immediately descend back into the much worse weather lower down (rain/snow/winds, low visibility). There was some wandering of heading and altitude during this period as I was forced to split focus between the instruments and checking breakers/etc using a flashlight. Shortly after the failure, I emerged out of the tops of the clouds in that area and in VMC conditions, and had no immediate icing concerns. With the loss of the wing fuel pumps to the header tank, I knew that although siphoning would continue to pull fuel to the header tank, it would be at a slower rate and fuel to the engine might eventually become an issue.

The breakers would not initially reset since the electrical systems were all still on. However, after load-shedding some of the icing equipment via their individual circuit breakers --since the "dead" control panel contains lighted push buttons (green dot light when on) without physical indication of whether they are on or off-- and waiting for a brief period, I was able to restore power to both main bus breakers. I was able to maintain an amp load below 70 amps for all electrical use (below the level of a single main breaker) in the plane with pitot and windshield heat on. I was actually enroute to the maintenance facility (for annual inspection), and much better weather was ahead at my destination than what was below. I elected to continue the trip and there were no further issues.

In retrospect, this failure would not have happened had I not engaged the "aux heat" which is an electric heater that warms the air coming out of the vent defog blower fan. That heater draws considerable amperage and I rarely have it on in active icing conditions. Generally that heater is on in high altitude cruise when it is too cold for icing, so only the pitot and windshield heaters are on when that is switched on. In those conditions the load is well below the 160 amp limit. It was the confluence of all the electrical systems engaged together with what may perhaps have been degraded breakers. I will recommend that the POH advise of high electrical loads in icing conditions. (Placing the PFD on main bus and avionics bus with fail over would improve redundancy too. Or having that Aux heat on the "non-essential" bus would have eliminated the risk too. 90 amp breakers might be nice too.)

My perception of time during the troubleshooting was very off. I thought the event lasted quite a while, 20 minutes or more. However, when I looked at Flight Aware, I was shocked to discover that the total elapsed time from failure to restoration of one of the breakers was 6-7 minutes or less. I am glad in that dilation of time, I didn't elect to make a rash decision such as deviating and descending as I believe that would have made matters worse. Taking time to troubleshoot resulted in a favorable resolution.

The incident also reinforced knowing the electrical systems (and all systems in general) well enough so as to conduct proper troubleshooting and to understand the knock-on implications of the loss of a particular bus (e.g.the potential for eventual engine power loss from inadequate fuel flow from the wing to the header tank due to loss of pumps). There is no "bus failure" process in the abnormal procedures for the aircraft. So I, while I don't think it was difficult to figure out how to correct the issue (load shed is pretty obvious), I didn't have a written guide.

I had been in a climb to FL260, so some amount of altitude was blocked by ATC, but while troubleshooting, my altitude peaked at FL25 before I returned to FL240 and maintained that altitude. ATC did not advise me of any issues with these altitude deviations, just requested I maintain my current heading, and were very cooperative and helpful during my troubleshooting.

Synopsis

PA46 pilot reported loss of dual main bus power, probably because of high electrical system demand in icing conditions.

ACN: 1363450 *(27 of 29)*

Time / Day

Date : 201606
Local Time Of Day : 1801-2400

Place

Locale Reference.Airport : ZZZ.Airport
State Reference : US
Altitude.MSL.Single Value : 1800

Environment

Flight Conditions : Mixed
Weather Elements / Visibility : Thunderstorm
Weather Elements / Visibility : Rain
Weather Elements / Visibility : Turbulence
Weather Elements / Visibility : Windshear
Weather Elements / Visibility.Visibility : 2
Light : Daylight
Ceiling.Single Value : 2000

Aircraft : 1

Reference : X
ATC / Advisory.TRACON : ZZZ
Aircraft Operator : Personal
Make Model Name : Bonanza 36
Crew Size.Number Of Crew : 2
Operating Under FAR Part : Part 91
Flight Plan : VFR
Mission : Training
Flight Phase : Initial Approach
Airspace.Class C : ZZZ

Aircraft : 2

Reference : Y
ATC / Advisory.TRACON : ZZZ
Make Model Name : Bombardier Learjet Undifferentiated or Other Model
Crew Size.Number Of Crew : 2
Flight Plan : IFR
Flight Phase : Climb
Airspace.Class C : ZZZ

Component : 1

Aircraft Component : Autopilot
Aircraft Reference : X
Problem : Failed

Component : 2

Aircraft Component : AHRS/ND
Aircraft Reference : X
Problem : Failed

Person

Reference : 1
Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Reporter Organization : Personal
Function.Flight Crew : Pilot Flying
Function.Flight Crew : Trainee
Qualification.Flight Crew : Private
Experience.Flight Crew.Total : 203
Experience.Flight Crew.Last 90 Days : 18
Experience.Flight Crew.Type : 106
ASRS Report Number.Accession Number : 1363450
Human Factors : Situational Awareness

Events

Anomaly.Aircraft Equipment Problem : Less Severe
Anomaly.Deviation / Discrepancy - Procedural : Clearance
Anomaly.Inflight Event / Encounter : Weather / Turbulence
Detector.Person : Flight Crew
Miss Distance.Vertical : 700
When Detected : In-flight
Result.Flight Crew : Returned To Departure Airport
Result.Flight Crew : Returned To Clearance
Result.Air Traffic Control : Separated Traffic
Result.Air Traffic Control : Provided Assistance

Assessments

Contributing Factors / Situations : Aircraft
Contributing Factors / Situations : Human Factors

Contributing Factors / Situations : Weather
Primary Problem : Aircraft

Narrative: 1

Enroute under VFR and climbing to 3,500 ft we experienced **AHRS** (Attitude and Heading Reference System) failure in the G1000, lost autopilot also. Troubleshooting breakers failed to resolve the problem (as attempted by my instructor). Decided to return to [departure airport] after a short 15 min flight. ATC gave me instructions 3500 ft to the south (weather was bad south), so I requested west instead and granted 3500 ft (no vectors) to the west, and to remain VFR. As I was approaching north side of [the airport] weather worsened, requested descent to 2500 ft and granted, asked by ATC to remain VFR (I have lost my **AHRS**). Ceiling rapidly worsened and inadvertently (in order to remain VFR as instructed, and with fear of getting into the clouds, with no instruments), I descended to 1800 ft without authorization. I was immediately requested by ATC to climb back to 2500 ft, as a Learjet was going missed approach. Weather changed rather fast, turbulence was moderate, there was a windshear alert, my instruments had failed, and in the sake of safety, I was concerned about forcing myself into the clouds at relative low altitude. I should have made a 180 instead, but by then I had the airport in sight, and the weather was clear 1-2 miles to the west.

Synopsis

Beech 36 pilot reported returning to the departure airport after experiencing a loss of **AHRS** and autopilot.

ACN: 1351170 *(28 of 29)*

Time / Day

Date : 201604
Local Time Of Day : 1801-2400

Place

Locale Reference.Airport : ZZZ.Airport
State Reference : US
Altitude.MSL.Single Value : 41000

Environment

Flight Conditions : IMC
Weather Elements / Visibility : Icing
Weather Elements / Visibility : Thunderstorm
Weather Elements / Visibility : Turbulence
Light : Dusk

Aircraft

Reference : X
ATC / Advisory.Center : ZZZ
Make Model Name : Cessna Citation Sovereign (C680)
Crew Size.Number Of Crew : 2
Operating Under FAR Part : Part 91
Flight Plan : IFR
Flight Phase : Descent
Airspace.Class A : ZZZ

Component

Aircraft Component : Pitot/Static Ice System
Aircraft Reference : X
Problem : Malfunctioning

Person : 1

Reference : 1
Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Function.Flight Crew : Captain
Function.Flight Crew : Pilot Flying
Qualification.Flight Crew : Air Transport Pilot (ATP)
ASRS Report Number.Accession Number : 1351170

Person : 2

Reference : 2
Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Function.Flight Crew : First Officer

Function.Flight Crew : Pilot Not Flying
Qualification.Flight Crew : Air Transport Pilot (ATP)
ASRS Report Number.Accession Number : 1351173

Events

Anomaly.Aircraft Equipment Problem : Critical
Anomaly.Inflight Event / Encounter : Weather / Turbulence
Detector.Person : Flight Crew
When Detected : In-flight
Result.Flight Crew : Diverted
Result.Flight Crew : Landed in Emergency Condition
Result.Flight Crew : Landed As Precaution

Assessments

Contributing Factors / Situations : Weather
Contributing Factors / Situations : Aircraft
Primary Problem : Aircraft

Narrative: 1

[Enroute] we determined our primary airport was not a workable option due to low ceilings and a tail wind component. We talked with the [client] and also talked with dispatch and [selected an alternate]. We were assigned the arrival into [the alternate] at FL410. Leaving FL410 we descended into the clouds which had thunderstorms in the area. At approximately FL280 we got the left inboard wing anti-ice cold amber case message during our descent. Leveling at FL260 the case message then extinguished. Shortly after this we got the left engine control fault followed with a right engine control fault which caused a loss of the autopilot and yaw A+B. We were able to eventually reset the autopilot and the control faults reset.

Several minutes later we again got the left and right engine control faults with a failure of the autopilot again. We also noted the L-engine carrot for the engine power turned to amber. The PIC noticed the airspeed indicator of the left side decreasing to 165KTS in the descent which didn't seem right, then we heard the overspeed clacker indicating an overspeed condition of the aircraft. We both then noted the overspeed condition on the right side along with the standby instruments. I then noted a slow decrease in airspeed on the left side all the way down to 30KTS. I transferred controls to the right seat pilot where the SIC stopped the rate of descent to level attitude. At this time we noted VFR conditions underneath us to the ground. We asked the controller if we had an airport underneath us and were told that [a suitable airport] was about 10 miles away with visual conditions. We decided to [request] priority handling to the airport. We then noted that the **AHRS** was totally inoperative with a red X on all the left instruments leaving me without any airspeed or any other reference data on the left side. The Controller then vectored us to a right downwind to the uncontrolled airport without any further incidence.

This reminds me of the simulator training we had recently which simulated [another air carrier] incident which had wrong airspeed indications due to severe icing conditions. We were fortunate this didn't affect the right side or standby instruments and it was also fortunate we had VFR conditions underneath us as [our first alternate] was at minimums and 30 minutes away.

Narrative: 2

I am very thankful for the sim training we had that covered icing/incorrect indications from Air Data Computer information. I quickly felt very confident of our assessment that the anti-ice/protection systems were unable to handle the conditions and [we took] corrective actions in response to the situation.

Synopsis

CE-680 flight crew reported diverting to an alternate after noting system multiple anomalies associated with probable pitot/static icing.

ACN: 1339829 *(29 of 29)*

Time / Day

Date : 201603
Local Time Of Day : 1801-2400

Place

Locale Reference.Airport : ZZZ.Airport
State Reference : US
Altitude.MSL.Single Value : 1200

Environment

Flight Conditions : VMC
Light : Night

Aircraft

Reference : X
ATC / Advisory.Tower : ZZZ
Aircraft Operator : FBO
Make Model Name : Skyhawk 172/Cutlass 172
Crew Size.Number Of Crew : 2
Operating Under FAR Part : Part 91
Flight Plan : IFR
Mission : Training
Nav In Use.VOR / VORTAC : ZZZ
Flight Phase : Final Approach
Airspace.Class D : ZZZ

Person

Reference : 1
Location Of Person.Aircraft : X
Location In Aircraft : Flight Deck
Reporter Organization : FBO
Function.Flight Crew : Instructor
Function.Flight Crew : Pilot Not Flying
Qualification.Flight Crew : Flight Instructor
Qualification.Flight Crew : Commercial
Qualification.Flight Crew : Instrument
Experience.Flight Crew.Total : 720
Experience.Flight Crew.Last 90 Days : 50
Experience.Flight Crew.Type : 250
ASRS Report Number.Accession Number : 1339829
Human Factors : Training / Qualification
Human Factors : Situational Awareness
Human Factors : Distraction

Events

Anomaly.Flight Deck / Cabin / Aircraft Event : Other / Unknown
Anomaly.Deviation / Discrepancy - Procedural : Published Material / Policy
Anomaly.Deviation / Discrepancy - Procedural : Clearance
Anomaly.Inflight Event / Encounter : CFTT / CFIT
Detector.Automation : Aircraft Terrain Warning
Detector.Person : Flight Crew
Detector.Person : Air Traffic Control
When Detected : In-flight
Result.Flight Crew : Took Evasive Action
Result.Air Traffic Control : Issued Advisory / Alert

Assessments

Contributing Factors / Situations : Human Factors
Primary Problem : Human Factors

Narrative: 1

Established on the final approach course for the VOR approach, 8 mile DME from the airport (3 miles from the final approach fix), the published altitude is 2400 ft MSL. The student I was teaching was flying the aircraft. I initiated a simulated, partial-panel situation by placing a card over the G1000 display, simulating an **AHRS**/ADC failure. The student proceeded to turn the aircraft and descend simultaneously. After correcting a minor course deviation, I looked down at my standby altimeter. I saw the needle on the number 2 (believing we were at 2200 ft MSL, 200 ft below the published altitude for that portion of the approach.) I soon realized we were at 1200 ft MSL. I assumed control of the aircraft and initiated a climb. The Tower called my tail number and issued a Low Altitude Alert. I informed the controller we were aware of the error and were in the process of correcting it.

I am a recently certified Instrument Flight Instructor, with very little experience as an Instrument Flight Instructor. We were in a high stress portion of the flight, and I neglected to pay attention to altitude along with the course deviation I was trying to correct. This was a learning experience as an instructor, and as a pilot.

Synopsis

A C172 flight instructor reported that the pilot being given instrument instruction had descended well below the published altitude on a VOR approach.

v2.9