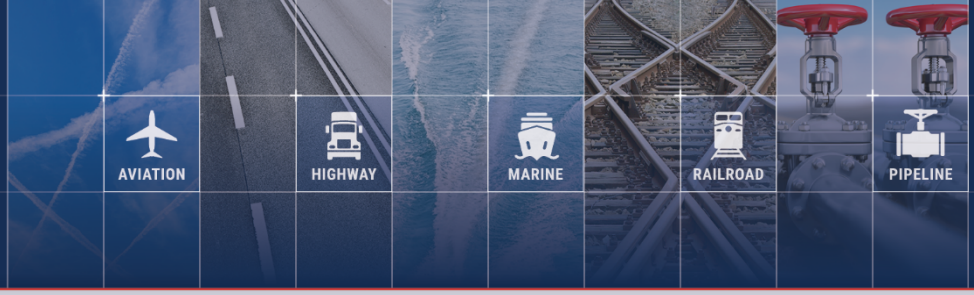

Aviation Investigation Final Report

Location:	Connellsville, Pennsylvania	**Accident Number:**	ERA22LA215
Date & Time:	May 2, 2022, 15:50 Local	**Registration:**	N46TA
Aircraft:	Cessna 414	**Aircraft Damage:**	Substantial
Defining Event:	Flight control sys malf/fail	**Injuries:**	1 Serious, 1 Minor
Flight Conducted Under:	Part 91: General aviation - Flight test		

Analysis

The pilot, who was also a mechanic, had been troubleshooting an autopilot issue before the accident flight. He had removed and reinstalled the autopilot mode control unit in the cockpit panel and planned to complete a local maintenance test flight. The pilot initiated the flight, completed a normal run-up, and reported that nothing was abnormal with the flight controls. During takeoff and after reaching the airplane's rotation speed, the pilot was unable to move the control wheel aft so that the elevator would move toward the airplane-nose-up direction. The pilot subsequently aborted the takeoff, but insufficient runway remained, and the airplane overran the runway and collided with trees. The fuselage and wings sustained substantial damage.

Postaccident examination of airplane's left-side cockpit avionics stack, which contained a GPS and radio unit, found that the avionics trays had sagged downward, resulting in the elevator bellcrank to become lodged within the lowest avionics tray. Further, the avionics trays were missing metal straps designed to secure the rear weight of the GPS and radio units to the structure of the airframe.

The avionics tray and elevator bellcrank exhibited significant scraping and metal polishing, which indicated that rubbing contact between the sagging avionics tray and the elevator bellcrank had likely been occurring for some time before the accident flight. Neither the pilot nor the passenger (who was also a mechanic) reported observing any anomalies with the flight controls during the preflight run-up but did report that the airplane hit a dip in the runway as the airplane approached its the rotation speed. Thus, this movement likely moved the tray further downward and into the movement area of the elevator bellcrank.

The Federal Aviation Administration had published advisory circular guidance advising mechanics to ensure that avionics units (including GPS and radio units) were properly secured with rear or side metal straps connected to a structural element on the aircraft. Review of maintenance records found no recent references to work involving the affected avionics or the securing of their avionics trays. The pilot had maintained the airplane for several years and signed off multiple annual inspections. During a postaccident interview, the pilot explained that he was not aware of the need to secure metal side or rear straps on avionics trays. Thus, because the pilot did not realize the need to properly secure the avionics trays to structural airplane elements, the trays eventually contacted the elevator bellcrank and precluded normal operation of the airplane's pitch controls.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

The pilot/mechanic's failure to properly secure two airplane avionics units, which resulted in the trays supporting the units to sag downward and become lodged in the movement area of the elevator bellcrank during the accident takeoff.

Findings

Personnel issues	Knowledge of equipment - Maintenance personnel
Personnel issues	Knowledge of equipment - Pilot
Aircraft	Elevator control system - Inadequate inspection
Aircraft	(general) - Inadequate inspection
Aircraft	Elevator control system - Failure

Factual Information

History of Flight

Prior to flight	Aircraft inspection event
Takeoff	Flight control sys malf/fail (Defining event)
Takeoff-rejected takeoff	Runway excursion
Takeoff-rejected takeoff	Collision during takeoff/land

On May 2, 2022, about 1550 eastern daylight time, a Cessna 414 airplane, N46TA, was substantially damaged when it was involved in an accident at Joseph A. Hardy Connellsville Airport (VVS), Connellsville, Pennsylvania. The commercial pilot sustained minor injuries, and the passenger sustained serious injuries. The flight was operated under the provisions of Title 14 *Code of Federal Regulations* Part 91 as a flight test.

The purpose of the flight was to perform a local maintenance test flight to evaluate the autopilot's performance. The pilot, who was also a mechanic, reported that, before the accident flight, he had removed and then reinstalled the S-TEC autopilot mode control unit in the cockpit due to a discrepancy reported on a previous flight.

The pilot stated that, after a normal taxi and "complete run-up," he initiated the takeoff for the accident flight. When the airplane reached rotation speed, he pulled back on the flight controls with one hand, but the flight controls did not move. The pilot then pulled back on the flight controls with both hands, but the flight controls still did not move. The passenger, who was also a mechanic, reported that the pilot was unable to rotate the airplane at rotation speed. The passenger recalled that the runway surface had a dip in it and that he felt a "bump" about the time that he expected rotation to occur.

The pilot aborted the takeoff and applied maximum braking. The airplane was unable to stop on the remaining runway and ran off the runway and down a ravine. The airplane subsequently collided with trees, which resulted in substantial damage to the airplane fuselage and wings. The pilot reported that there was nothing "strange" with the flight controls during the run-up. The passenger recalled that the flight controls were functional before takeoff.

Postaccident examination of the cockpit panel revealed that the left avionics stack included a Garmin GNS 530 GPS and a Bendix-King KX-155 navigation/communication receiver. The avionics tray on the left side that held the KX-155 unit was found stuck within the opening area of the elevator bellcrank. When the flight controls were moved forward or aft, which also moved the elevator bellcrank forward and aft, the controls would not move. The trays in the left avionics stack were found sagging downward, and the avionics units would move downward when the front of the units were pushed by hand.

Further examination revealed that the bottom rearward portion of the KX-155 avionics tray was deformed and that the tray and the bellcrank displayed significant scratching and metal polishing. When the avionics tray was removed from the bellcrank movement area, the flight controls operated with a full range of movement.

The avionics trays holding the GNS 530 and KX-155 equipment were secured to the sheet metal on the front of the cockpit panel, but neither avionics tray had metal straps that secured the rear or sides of the tray to the airplane's structure of the airplane. The KX-155 avionics tray had a metal strap on its left side that was not connected to any structure of the airframe. No other avionics trays had straps connected to the airframe structure.

Figure 1 shows the cockpit, elevator bellcrank and KX-155 avionics tray. Figure 2 shows a closer view of the KX-155 avionics tray.

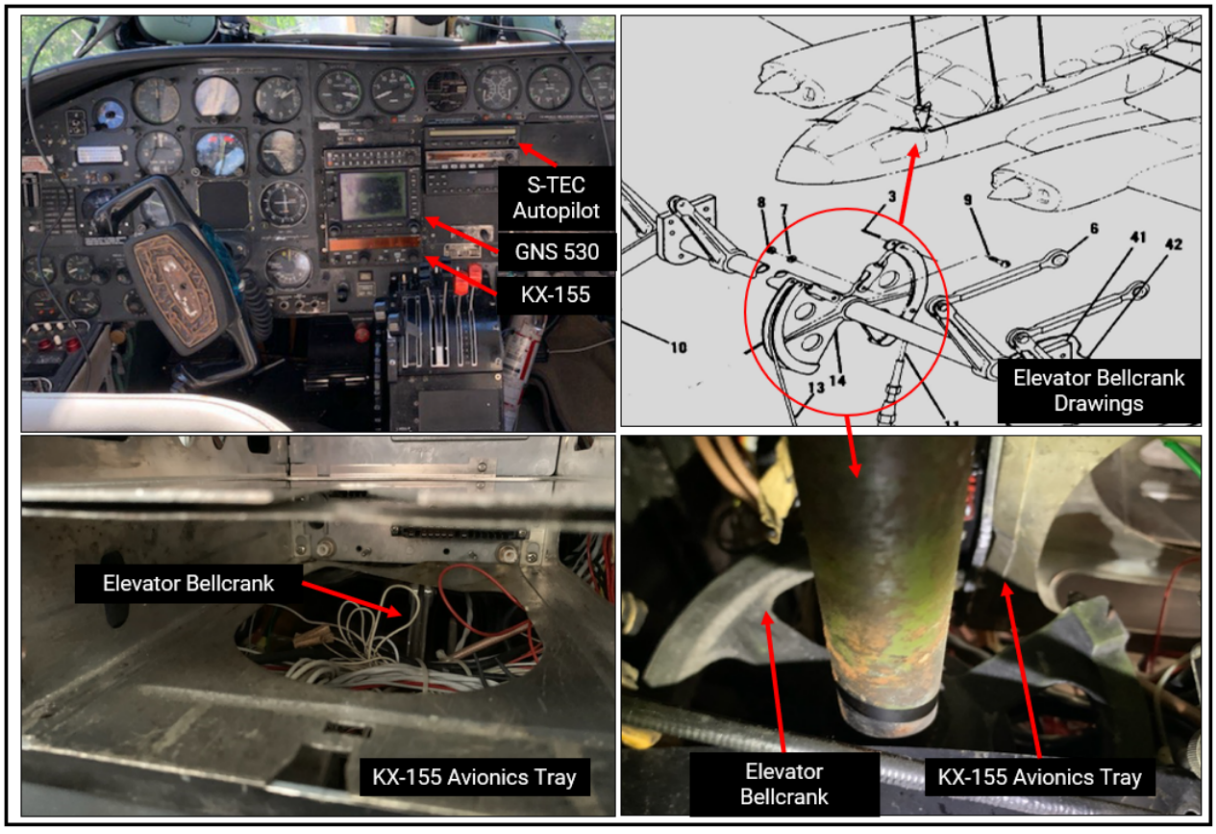

Figure 1. Cockpit, avionics trays, and elevator bellcrank (Source: Federal Aviation Administration).

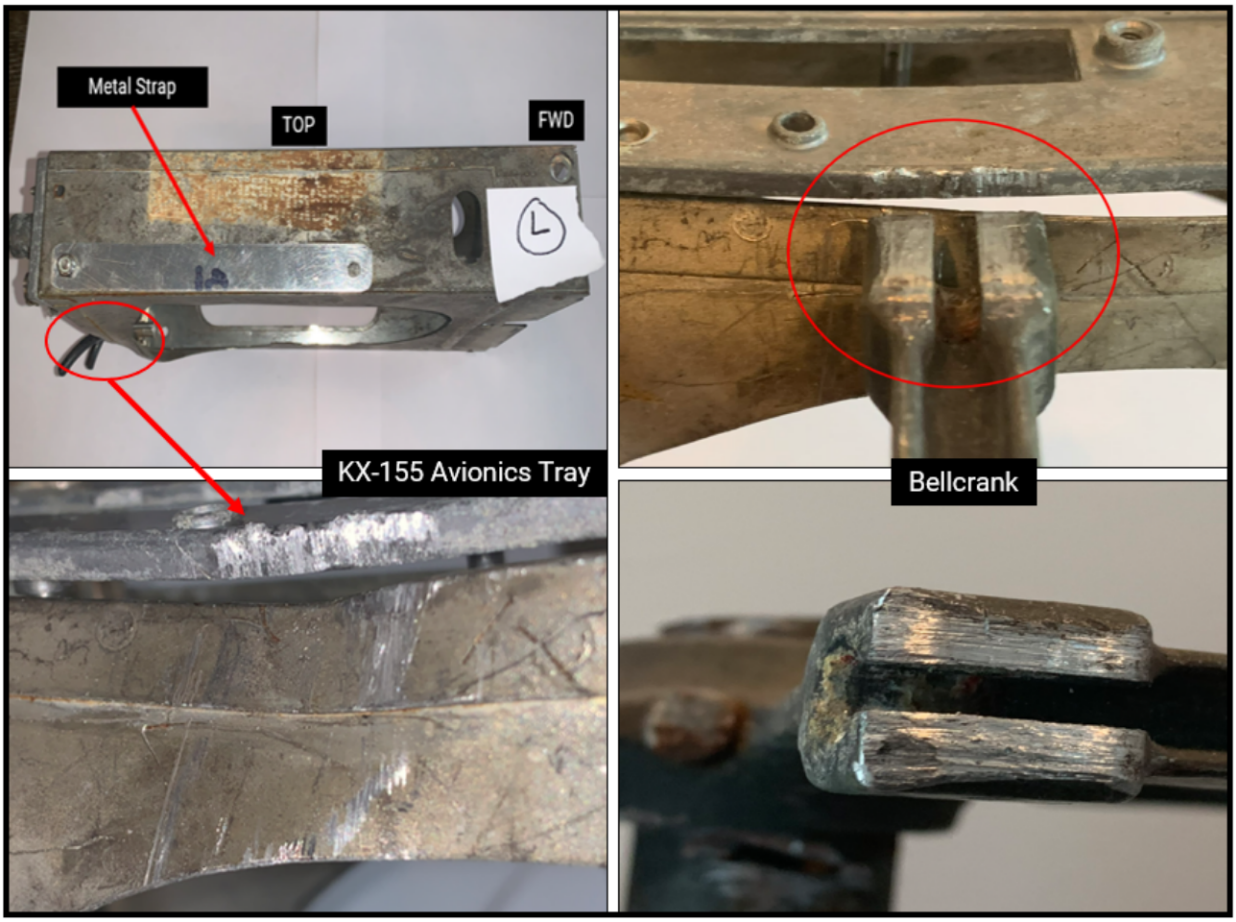

Figure 2. Scratches found on the elevator bellcrank and KX-155 avionics tray (Source: Federal Aviation Administration). Note: The "FWD" label in the top left photograph shows where the face of the KX-155 unit was located.

Review of Federal Aviation Administration airworthiness records revealed that the Garmin GNS 530 was first installed in the accident airplane in 2006. Review of the maintenance records starting in 2006 found no entries relating to the removal and reinstallation of the GNS 530 or the KX-155 unit.

The pilot/mechanic stated that he performed numerous inspections on the accident airplane starting in 2016. The pilot/mechanic also stated that, before the accident, he "didn't even know to look for this" on avionics trays.

Federal Aviation Administration Advisory Circular 43.13-2A, Acceptable Methods, Techniques, and Practices - Aircraft Alterations, chapter 2, Radio Installations, stated in part the following:

> *To minimize the load on a stationary instrument panel, whenever practicable, install a support between the rear (or side) surface of the radio case and a nearby structural member of the aircraft.*

Pilot Information

Certificate:	Commercial	**Age:**	60,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	
Medical Certification:	Class 1 Waiver time limited special	**Last FAA Medical Exam:**	October 22, 2021
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	March 6, 2022
Flight Time:	13600 hours (Total, all aircraft), 5212 hours (Total, this make and model), 13300 hours (Pilot In Command, all aircraft), 77 hours (Last 90 days, all aircraft), 77 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

Other flight crew Information

Certificate:	None	**Age:**	Male
Airplane Rating(s):	None	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	None	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	
Medical Certification:	None	**Last FAA Medical Exam:**	
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:			

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N46TA
Model/Series:	414 Undesignated Series	**Aircraft Category:**	Airplane
Year of Manufacture:	1972	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	414-0466
Landing Gear Type:	Retractable - Tricycle	**Seats:**	7
Date/Type of Last Inspection:	April 18, 2022 100 hour	**Certified Max Gross Wt.:**	6750 lbs
Time Since Last Inspection:	25 Hrs	**Engines:**	2 Reciprocating
Airframe Total Time:	8762 Hrs at time of accident	**Engine Manufacturer:**	Continental Motors Incorporated
ELT:	C91 installed, activated, did not aid in locating accident	**Engine Model/Series:**	TSIO-520NB
Registered Owner:	BJK AVIATION LLC	**Rated Power:**	325 Horsepower
Operator:	AIR TRAVEL MANAGEMENT LLC.	**Operating Certificate(s) Held:**	On-demand air taxi (135)
Operator Does Business As:	AIR TRAVEL MANAGEMENT LLC.	**Operator Designator Code:**	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	LBE,1199 ft msl	**Distance from Accident Site:**	23 Nautical Miles
Observation Time:	16:47 Local	**Direction from Accident Site:**	32°
Lowest Cloud Condition:	Scattered / 5000 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	8 knots / 15 knots	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:	260°	**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	30.03 inches Hg	**Temperature/Dew Point:**	20°C / 8°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Connellsville, PA (VVS)	**Type of Flight Plan Filed:**	None
Destination:	Connellsville, PA (VVS)	**Type of Clearance:**	None
Departure Time:	15:50 Local	**Type of Airspace:**	Class G

Airport Information

Airport:	Joseph A Hardy Connellsville Airport VVS	**Runway Surface Type:**	Asphalt
Airport Elevation:	1264 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	5/23	**IFR Approach:**	None
Runway Length/Width:	3833 ft / 100 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 Minor	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Serious	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Serious, 1 Minor	**Latitude, Longitude:**	39.956057,-79.663785

Administrative Information

Investigator In Charge (IIC):	Gerhardt, Adam
Additional Participating Persons:	Gary Ankney; FAA/FSDO; Pittsburg, PA
Original Publish Date:	October 19, 2023
Last Revision Date:	
Investigation Class:	Class 3
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=105031