National Transportation Safety Board
Aviation Accident Factual Report

Location:	Nelsonia, VA	**Accident Number:**	NYC04LA035
Date & Time:	11/16/2003, 1119 EST	**Registration:**	N999GC
Aircraft:	Northam RAF 2000	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General Aviation - Personal		

On November 16, 2003, at 1119 eastern standard time, a homebuilt RAF 2000 gyroplane, N999GC, was destroyed when it struck the ground in Nelsonia, Virginia. The certificated airline transport pilot was fatally injured. Visual meteorological conditions prevailed for the personal flight that originated from Accomack County Airport (MFV), Melfa, Virginia. No flight plan had been filed for the local flight that was conducted under 14 CFR Part 91.

Personnel at the departure airport reported that the pilot had initiated a takeoff, and then aborted the takeoff for unknown reasons. He pulled clear of the runway and stayed there for about 10 minutes with the engine idling. He then pulled back on the runway and departed about 1028. That was the last he was seen at the airport.

The gyroplane was next observed by a witness, who was located about 2 miles northwest of the accident site. The witness reported that when she first observed the gyroplane, the nose was oscillating up and down. The oscillations smoothed out, and the gyroplane continued in straight and level flight to the southeast. Shortly after the gyroplane disappeared from view, she observed a rising column of black smoke coming from the direction the gyroplane was headed.

Additional interviews of witnesses in the area revealed that three of the witnesses reported that the gyroplane was in level flight when it rolled left to the inverted position, and then descended in a nose down attitude and impacted the ground. One other witness thought that the gyroplane had first pitched up to a near vertical attitude, and then reversed course and impacted the ground in a nose down attitude. The witnesses agreed that the gyroplane burst into flames after the impact.

The examination of the wreckage revealed that both main rotor blades had red paint transfer marks on the top and bottom side of the blades, 67 inches from the end of the blade straps, consistent with the location of the vertical stabilizer. In addition, there were strike marks on underside of both blade tension straps, consistent with the location of the engine propeller.

One main rotor blade was straight, while the other was bent up about 20 degrees at the mid-

span location. There was no evidence of rearward bending of the blades.

A portion of the rudder was consumed in the fire. However, the upper portion of the rudder was separated from the aircraft and found outside of the burn area. There was impact damage on the left side of the separated piece.

The gyroplane was equipped with a fixed incident, horizontal stabilizer, which had winglets that were canted 20 degrees outboard of vertical. The condition of the right winglet was consistent with a main rotor blade strike.

Flight control continuity was not confirmed due to impact and fire damage.

In addition, the main mast was separated below the rotor hub, and one propeller blade was found separated from the remainder of the blade.

Re-examination of the impact site revealed that all items found away from the main impact area were light items and subject to lateral movement from wind. The direction of movement of the objects did not match the flight path described by witnesses.

The gyroplane had been modified with the addition of a fixed incident horizontal stabilizer. This was not recommended by the kit manufacturer. However, the experimental airworthiness certificate of the gyroplane did not preclude additions, deletions, or modifications from the original kit design.

The pilot was reported to have accumulated about 70 hours in make and model. This included 20 hours of dual instruction in another RAF 2000, and then 50 hours in his own RAF 2000.

The pilot's flight experience was reported to be in excess of 14,550 hours. He held ratings for airplanes single and multi-engine, and instrument airplane. He did not posses a rotorcraft, gyroplane, category and class rating, nor was he required under existing rules from the Federal Aviation Administration (FAA).

Toxicological testing conducted by the FAA Toxicology Accident Research Laboratory, Oklahoma City, Oklahoma, revealed the following:

17 mg/dl ethanol detected in urine

2 mg/dl acetaldehyde detected in urine

2 mg/dl n-propanol detected in urine

86.36 ug/ml acetaminophen detected in urine

452 ug/ml salicylate detected in urine

No ethanol in lung

No ethanol in brain

The toxicological report also noted that the samples were received in putrefied condition.

The toxicological report received from the State of Virginia reported an alcohol content of 0.01 percent ethanol by volume. In addition, ethanol was not detected in vitreous fluid.

On November 18, 2003, an autopsy was conducted by Wendy Gunther, MD, Assistant Chief Medical Examiner, Tidewater District, State of Virginia.

According to the FAA-H-8083-21 Rotorcraft Flying Handbook, Chapter 21, Gyroplane Emergencies, pilot induced oscillations (PIO) can occur in both the longitudinal and lateral axis. The publication further stated:

"...As with most other rotor-wing aircraft, gyroplanes experience a slight delay between control input and the reaction of the aircraft. This delay may cause an inexperienced pilot to apply more control input than required, causing a greater aircraft response than was desired. Once the error has been recognized, opposite control input is applied to correct the flight attitude. Because of the nature of the delay in aircraft response, it is possible for the corrections to be out of synchronization with the movements of the aircraft and aggravate the undesired changes in attitude. The result is PIO, or unintentional oscillations that can grow rapidly in magnitude...."

"...the stability of a gyroplane is greatly influenced by rotor force. If rotor force is rapidly removed, some gyroplanes have a tendency to pitch forward abruptly. This is often referred to as a forward tumble, buntover, or power pushover. Removing the rotor force is often referred to as unloading the rotor, and can occur if pilot-induced oscillations become excessive, if extremely turbulent conditions are encountered, or the nose of the gyroplane is pushed forward rapidly after a steep climb."

"A power pushover can occur on some gyroplanes that have the propeller thrust line above the center of gravity and do not have an adequate horizontal stabilizer. In this case, when the rotor is unloaded, the propeller thrust magnifies the pitching moment around the center of gravity. Unless a correction is made, this nose pitching action could become self-sustaining and irreversible. An adequate horizontal stabilizer slows the pitching rate and allows time for recovery."

"Since there is some disagreement between manufacturers as to the proper recovery procedure

for this situation, you must check with the manufacturer of your gyroplane. In most cases, you need to remove power and load the rotor blades. Some manufacturers, especially those with gyroplanes where the propeller thrust line is above the center of gravity, recommend that you need to immediately remove power in order to prevent a power pushover situation. Other manufacturers recommend that you first try to load the rotor blades. For the proper positioning of the cyclic when loading up the rotor blades, check with the manufacturer."

"When compared to other aircraft, the gyroplane is just as safe and very reliable. The most important factor, as in all aircraft, is pilot proficiency. Proper training and flight experience helps prevent the risks associated with pilot-induced oscillation or buntover...."

Pilot Information

Certificate:	Airline Transport; Flight Instructor; Commercial; Flight Engineer	**Age:**	51, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 Valid Medical--w/ waivers/lim.	**Last FAA Medical Exam:**	09/29/2003
Occupational Pilot:		**Last Flight Review or Equivalent:**	03/19/2003
Flight Time:	14550 hours (Total, all aircraft), 70 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	Northam	**Registration:**	N999GC
Model/Series:	RAF 2000	**Aircraft Category:**	Gyroplane
Year of Manufacture:		**Amateur Built:**	Yes
Airworthiness Certificate:	Experimental	**Serial Number:**	H2-02-13540
Landing Gear Type:	Tricycle	**Seats:**	2
Date/Type of Last Inspection:	07/07/2003, Condition	**Certified Max Gross Wt.:**	1540 lbs
Time Since Last Inspection:	50 Hours	**Engines:**	1 Reciprocating
Airframe Total Time:	50 Hours at time of accident	**Engine Manufacturer:**	Subaru
ELT:	Not installed	**Engine Model/Series:**	EJ 22
Registered Owner:	On file	**Rated Power:**	130 hp
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Day
Observation Facility, Elevation:	WAL, 40 ft msl	**Distance from Accident Site:**	10 Nautical Miles
Observation Time:	1054 EST	**Direction from Accident Site:**	57°
Lowest Cloud Condition:		**Visibility**	10 Miles
Lowest Ceiling:	Overcast / 5000 ft agl	**Visibility (RVR):**	
Wind Speed/Gusts:	9 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	180°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.23 inches Hg	**Temperature/Dew Point:**	14°C / 6°C
Precipitation and Obscuration:			
Departure Point:	Melfa, VA (MFV)	**Type of Flight Plan Filed:**	None
Destination:	(MFV)	**Type of Clearance:**	None
Departure Time:	1028 EST	**Type of Airspace:**	Class G

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	N/A	**Aircraft Fire:**	On-Ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal	**Latitude, Longitude:**	37.821667, -75.610278

Administrative Information

Investigator In Charge (IIC):	Robert L Hancock
Additional Participating Persons:	Arthur Munns; Federal Aviation Administration; Richmond, VA
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at pubinq@ntsb.gov, or at 800-877-6799. Dockets released after this date are available at http://dms.ntsb.gov/pubdms/.