

**NATIONAL TRANSPORTATION SAFETY BOARD
OFFICE OF AVIATION SAFETY
WASHINGTON, D.C. 20594**

March 2, 2001

POWERPLANTS GROUP CHAIRMAN'S FACTUAL REPORT

NTSB ID No.: DEN01FA044

A. ACCIDENT

Location: Watkins, Colorado
Date: January 24, 2001
Time: 1127 mountain standard time (MST)
Aircraft: Aero Vodochody L-39CT, N602MC

B. POWERPLANTS GROUP

Investigator-in-Charge	James F. Struhsaker National Transportation Safety Board Denver, Colorado
Chairman:	Gordon J. Hookey National Transportation Safety Board Washington, D.C.
Member:	Eugene G. Dessel Atlas Air Purchase, New York
Member:	Donald E. Dewey Atlas Air Denver, Colorado
Member:	John B. McAvoy Czech Jet Hollister Airport, California

C. SUMMARY

On January 24, 2001, at 1127 MST, an Aero Vodochody L-39CT airplane, N602MC, equipped with an Ivchenko AI-25TL turbofan engine, crashed at Watkins, Colorado, shortly after takeoff from the Front Range Airport. The airplane was operating under the provisions of 14 Code of Federal Regulations Part 91. The pilot and the passenger were killed.

The engine, along with the other airplane wreckage, was removed from the crash site and transported to Beegles Air Service, Greeley, Colorado. On February 1, 2001, the engine was partially disassembled and examined by the Powerplants Group at Beegles Air Service. The examination did not reveal any evidence of a preimpact internal failure, inflight fire, case rupture, or uncontainment. Additionally, the examination revealed evidence that the engine's fan/low pressure and high pressure rotors were rotating at the time of impact.

D. DETAILS OF INVESTIGATION

1. Engine information

The engine installed in N602MC was an Ivchenko AI-25TL turbofan.¹ The AI-25TL turbofan engine features a 3-stage fan/low pressure compressor (LPC), 8-stage high pressure compressor (HPC), annular combustor with 12 fuel nozzles, 1-stage high pressure turbine (HPT), and a 2-stage low pressure turbine (LPT). The AI-25TL engine has a takeoff thrust rating of 3,792 pounds.

According to the airplane's and engine's maintenance records, the engine installed in N602MC was serial number 3942 and had accumulated 118 hours total time since new.

2. External examination

The engine was intact from the intermediate case between the LPC and HPC rearward to the exhaust. The fan/LPC was separated from the engine, but parts of the fan/LPC were recovered with the wreckage.

The fan case was separated from the engine, but was recovered. The fan duct around the HPC was missing. The combustor and turbine fan duct did not have any indication of an inflight fire. The combustor and turbine fan ducts were buckled all around and were crushed against the combustor and turbine cases and pushed axially rearward along the bottom of the engine.

¹ The Ivchenko Design Bureau is a manufacturer of turbine and reciprocating engines located in Zaporozhye, Ukraine, Confederation of Independent States.

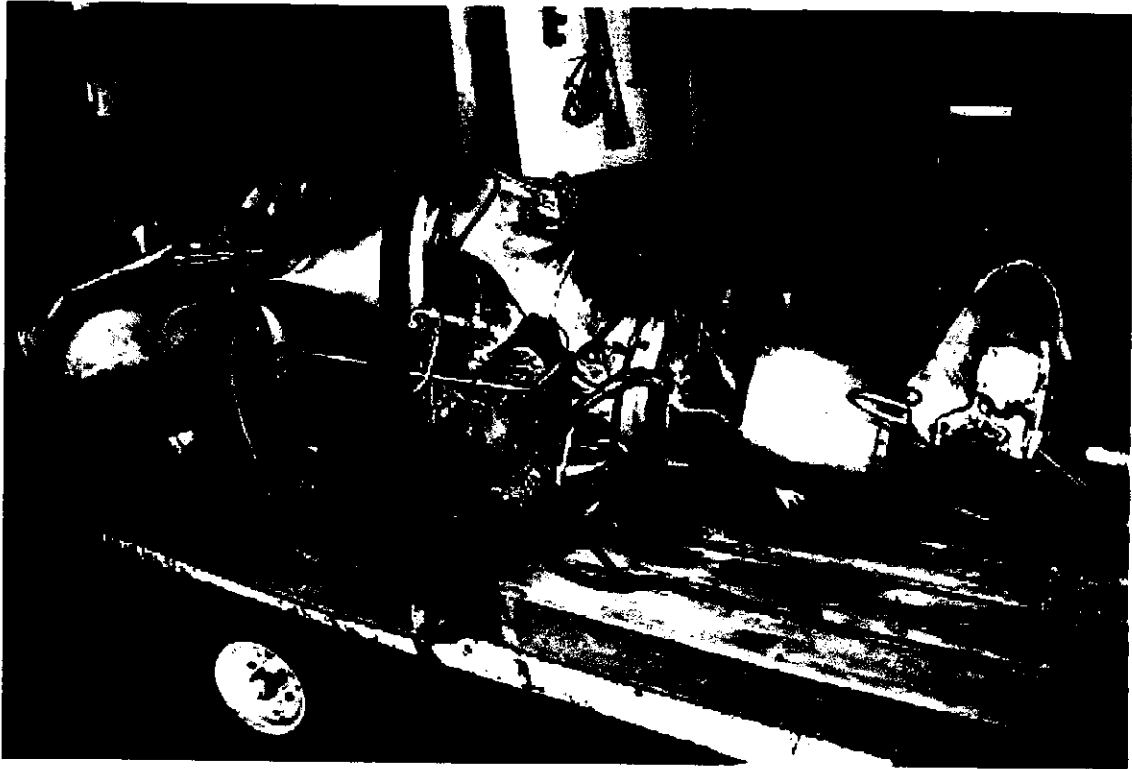


Photo 1: View of bottom of engine.

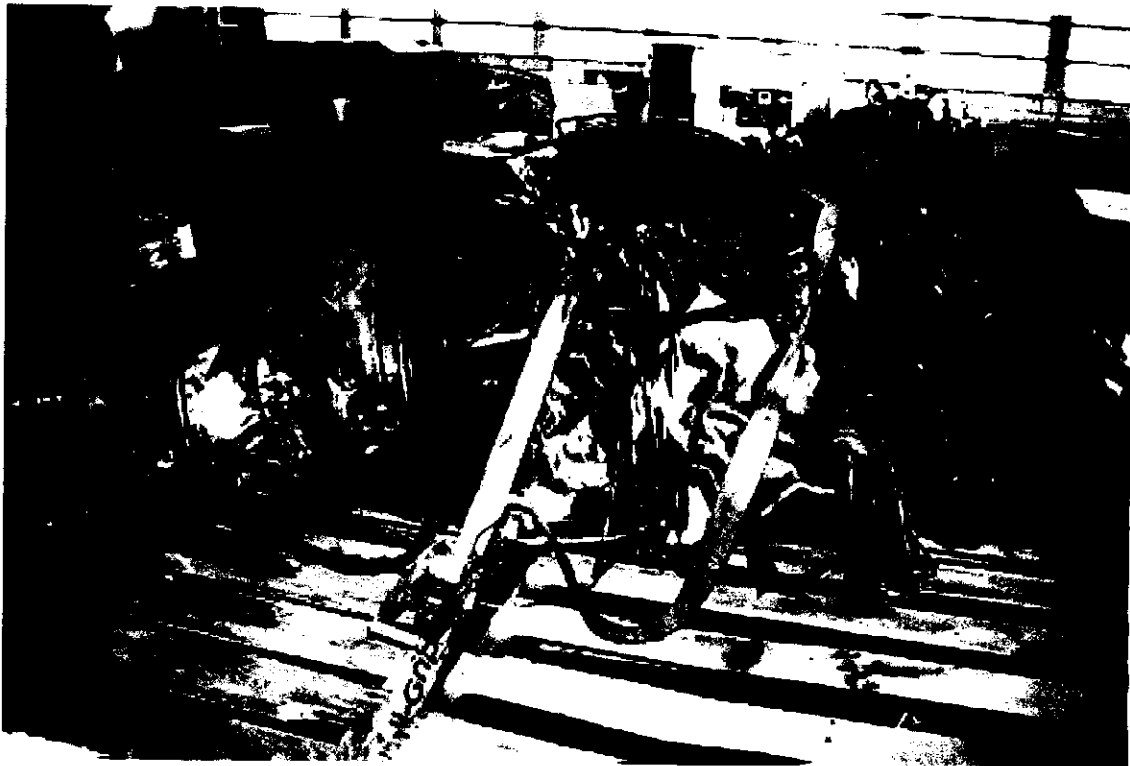


Photo 2: View of top of engine.

3. Fan/low pressure compressor

The fan/LPC was completely separated from the engine.

The second-and third-stage fan/LPC disks were intact and still joined together. There were 10 second-stage fan blades and 1 third-stage fan blade that were full length and bent opposite the direction of engine rotation. All of the other second-and third-stage fan blades were fractured transversely across the airfoil adjacent to the blade root platform.

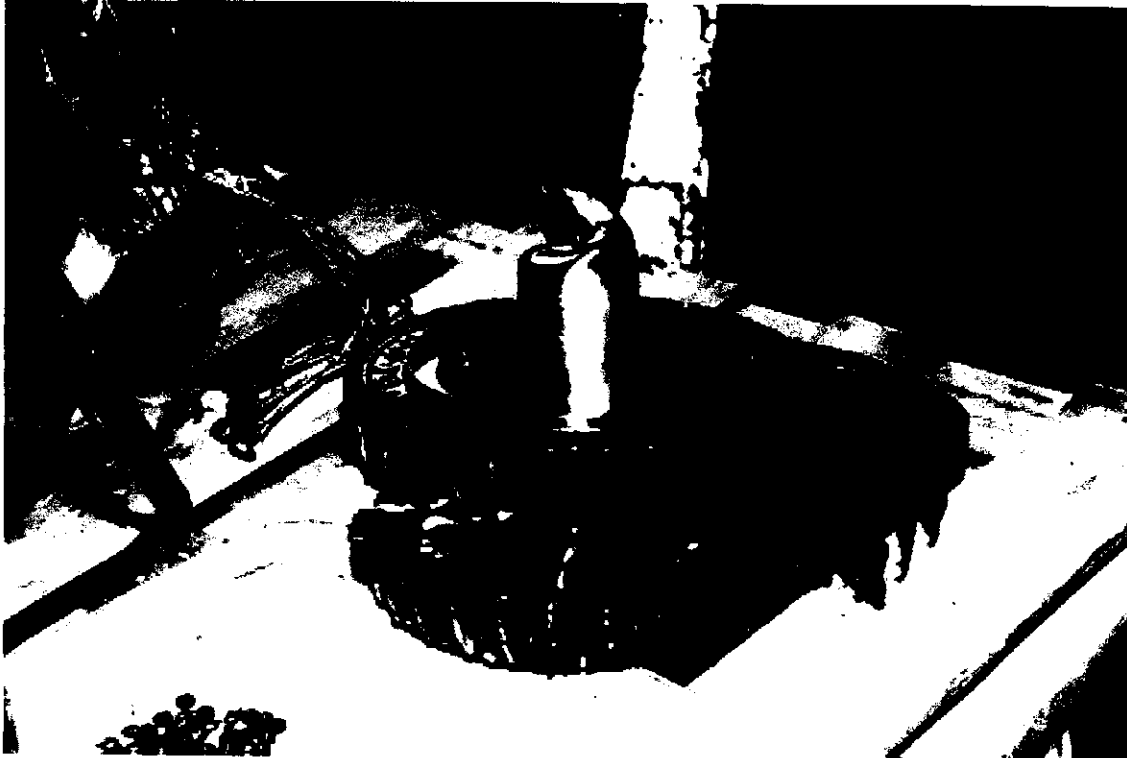


Photo 3: Second-and third-stage fan/LPC disks and blades.

The second-to-third-stage fan spacer was intact and the knife edges were intact.

The fan drive shaft was twisted and broken.

The first-stage fan rotor could not be located for examination.

The fan case was intact, crushed radially, and did not have any penetrations. There were 11 second-stage and 13 third-stage fan stator vanes in the fan case and all were bent towards the direction of engine rotation.²

² The Ivchenko AI-25TL engine's fan/low pressure and high pressure rotors rotate counterclockwise, as viewed from the rear looking forward.



Photo 4: Fan/LPC case.

4. High pressure compressor

The HPC case did not have any indications of an uncontainment.

The HPC case was partially removed to facilitate examination, but the HPC was not disassembled.

The first-, fifth-, sixth-, seventh-, and eighth-stage HPC disks, which were the only disks visible, were intact. The first-stage HPC blades were in place and full length, but were bent opposite the direction of engine rotation. The fifth-, sixth-, seventh-, and eighth- stage compressor blades were out of the blade slots and found laying loose next to the respective disks, but the airfoils were bent opposite the direction of engine rotation.

The variable stator vanes (VSV) were all in place and intact. The VSVs were in random positions from in line with the airflow to perpendicular to the airflow.

The VSV synchronizing ring was broken and about half of the VSV lever arms were disconnected from the VSV synchronizing ring.

The stator vane shrouds were all intact. The stator vanes were in place, but the leading and trailing edges were bent and curled in the direction of engine rotation.



Photo 5: Front of HPC showing blades bent opposite the direction of rotation.



Photo 6: View of rear of HPC showing missing blades and vanes bent in direction of rotation.

5. Combustor

The combustor case did not have any ruptures or indications of thermal distress. The bottom of the combustor case was sooted from the postimpact fire.

The fuel manifolds and fuel nozzles were all in place and there was no indication of leakage or thermal distress.

The combustor section was not disassembled.

6. High pressure turbine

The HPT was not disassembled.

7. Low pressure turbine

The second-stage LPT disk was intact. All of the second-stage LPT blades were in place and full length except for one blade that was missing the tip shroud. All of the second-stage LPT blades were bent about 1-inch radially inboard from the tip opposite the direction of the engine rotation. The second-stage LPT blade airfoils did not have any metal spatter. The second-stage LPT blade tip knife edges had rub marks that corresponded to the rub marks on the second-stage LPT air seal.



Photo 7: View of second-stage LPT blades bent opposite the direction of rotation

The second-stage turbine vanes were all in place and intact. The second-stage turbine vane airfoils did not have any metal spatter.

The second-stage turbine outer air seal had a circumferential rub mark that corresponded to the rub marks on the second-stage turbine blade tip shroud knife edges.

The LPT was not disassembled.

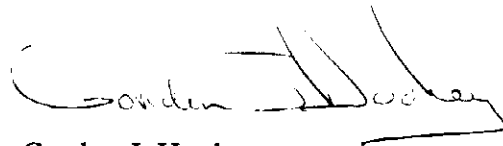
8. Exhaust

The gas generator exhaust duct did not have any impact marks or metal spatter on the inner diameter surface.

9. Bearings

The race for the No. 2 bearing, which is a roller bearing supporting the rear of the fan/LPC, was wet with oil and did not have any rotational distress.

The No. 3 bearing, which is a ball bearing on the front of the HPC, was wet with oil and did not have any rotational distress.



Gordon J. Hookey
Powerplants Group Chairman

J. J. O'Keefe
3/2/01