Final Report

on the results of the investigation into the fatal accident of a Grumman AA-5 private aircraft, which occurred on 01.05.2020 at “Kamyanka” airfield, Dnipro city.

In accordance with Part 1., Art. 119 of the Air Code of Ukraine, paragraph 6 of the Regulation on the National Bureau for Investigation of Aviation Incidents and Incidents with Civil Aircraft, approved by the Cabinet of Ministers of Ukraine dated May 13, 2020 № 417, as well as with standards and recommended practices of the International Civil Aviation Organization, this Report is issued with the sole purpose of preventing air occurrences in the future.

The investigation of the fatal accident of a private aircraft Grumman AA-5 UR-DCJ, which occurred on 01.05.2020 at "Kamyanka" airfield, city of Dnipro, was conducted by a team appointed by the Order of the National Bureau for Investigation of Air Incidents and Incidents with Civil Aircraft (NBAAI) № 31 as of 01.05.2020.

Note:
This report is a translation of the Ukrainian original investigation report. The text in Ukrainian shall prevail in the interpretation of the report.

Information on the fatal accident (Synopsis)

On May 1, 2020, the crew of a private Grumman AA-5 UR-DCJ aircraft (consisting of a pilot and an instructor pilot) performed private flights in a circle in the area of "Kamyanka" airfield (Dnipro city). During the next take-off, at 16:20 LT, at the true altitude of 30-40 meters, the engine failed, the pilot-instructor, who at that time was piloting the aircraft, made a U-turn with a large roll. The plane collided at a large angle with the ground. The aircraft caught fire due to a collision with the ground. As a result of the fatal accident, the pilot and the pilot instructor were killed, the aircraft was destroyed.

The information on the fatal accident was received by the NBAAI from CDS of State Aviation Service of Ukraine and Civil Aviation Search and Rescue Coordination Center.

In compliance with standards and recommended practices of the International Civil Aviation Organization, this Report is issued with the sole purpose of preventing air occurrences in the future.

According to the second paragraph of the fifth part of Article 119 of the Air Code of Ukraine, the report and materials of the technical investigation shall not be used by administrative, official, prosecutorial, judicial bodies, insurers to establish a guilt or liability.

The investigation opened – 02.05.2020

The investigation closed – 27.07.2021.

LIST OF ABBREVIATIONS
which were used in the Report and in the investigation materials

Aviation SRFM – Aviation Search Rescue Forces and Means

PASRCC – Principal Search and Rescue Coordination Center

SASU – State Aviation Service of Ukraine

SES – State Emergency Service

LT – Local time

CA SRCC – Civil Aviation Search and Rescue Coordination Center

FOP – Flights Operating Manual

AOM – Aircraft Operating Manual

PIC – Pilot-in-Command

NBAAI - National Bureau of Air Accidents Investigation with Civil Aircraft

MH – Magnetic heading

ATS – Air Traffic Service

UkrSATSU – State Enterprise of Air Traffic Services of Ukraine.

AF AFU – Air Force of Armed Forces of Ukraine

AF – Airfield

FLM – Fuel and lubrication materials

VFR – Visual flihgts rules

SMC – Simple meteorological conditions

FIS – Flight information service

AC – aircraft

ICAO – International Civil Aviation Organization (Ukraine is its member)

FIC – Flight information Center

GAMET – Ground Area Meteo

SIGMET – Significant Meteorological Information

UTC – Coordinated Universal Time

MOC – Means of objective control

1. Actual infornation

1.1 History of the flight

On 01.05.2020 (from the explanations of the owner of the aircraft), the owner of the Grumman AA-5 UR-DCJ aircraft and his son by his own car, at about 11:30 (MS) arrived at "Kamyanka" airfield (city of Dnipro) where his Grumman AA- 5 UR-DCJ aircraft was based. It was planned to perform flights in a circle in the area of "Kamyanka" airfield.

The flights were to be performed in the conditions of general air traffic outside the controlled airspace of air traffic services, therefore according to item 18 of the Regulations on the use of airspace of Ukraine, the application for the use of airspace was not submitted.

The Grumman AA-5 UR-DCJ aircraft is permanently based at "Kamyanka" airfield as per the terms of the contract for the provision of service and access to the operation of the airfield, approved by the Decision of the Executive Committee of the City Council on November 26, 2019 № 1200.

The owner and his son inspected the aircraft and prepared it for flight by themselves. Each fuel tank of the aircraft was filled with 20 liters of A-95 auto gasoline which was purchased at the "Neftek" gas station.

After that, the son of the owner of the aircraft called up the air defense authorities and the controller of "Dnipro-Information" and informed them about the beginning of the flights.

Note: *Due to the fact that the flight was performed in the same time zone, according to the recommendations of ICAO Annex 13, here and below the circumstances are set out in Local time. The difference between Local time and UTC = - 3 hours.*

The first flight was performed by the son of the owner of the aircraft. At 12:45 he contacted the dispatcher of Dnipro-Information and declared the take-off from Kamyanka airfield at 12:44.

At 13:07 the pilot of the plane got in touch and reported about a temporary landing on "Kamyanka" airfield at 13:14.

After that, the owner of the plane took the place in the cockpit. At 13:4, the pilot (aircraft owner) reported about the takeoff from Kamyanka airfield at 13:40 and his flying at 1,200 feet at QNH 1009 over the Dnipro. The information was confirmed by "Dnipro-Information" controller.

At 13:55, the pilot of the aircraft got in touch and reported about a temporary landing on the Kamyanka airfield at 14:00.

Note: *During the flights, the controller of Dnipro-Information repeatedly contacted the pilot of UR-DCJ and informed him about the flights of other aircraft in the area of "Kamyanka" airfield.*

At 14:13 the pilot (the owner of the aircraft) reported on a take-off from "Kamyanka" airfield at 14:12 and his flying on an altitude of 1500 feet at a pressure of QNH 1009 over the Dnipro.

"Dnipro-Information" controller confirmed the information.

At 14:25 The pilot of the aircraft got in touch and reported on a temporary landing on Kamyanka airfield at 14:32.

After landing and taxiing to the parking lot, the aircraft was refuelled with 40 liters of fuel (by 20 liters in the tank of each wing).

At 14:49 the pilot (the owner of the aircraft) reported on a take-off from Kamyanka airfield at 14:48 and on his flying flight at an altitude of 1500 feet at a pressure of QNH 1009 over the Dnipro.

At 15:03, the pilot got in touch and reported on a temporary landing on the "Kamyanka" airfield on 15:09.

After landing, the pilot's son took the place of the pilot.

At 15:26 the pilot (the son of the owner of the aircraft) reported on a take-off from Kamyanka airfield at 15:25 and his flying at an altitude of 1500 feet at a pressure of QNH 1009 over the Dnipro. At 15:50 the pilot got in touch and reported on a temporary landing on the "Kamyanka" airfield at 15:55.

After landing, the pilot instructor, who had a valid private pilot's license, sat on the right pilot's seat. The pilot instructor boarded ton he aircraft by the permission of the aircraft owner and with the purpose to maintain his flight skills and to provide the owner's son with additional flight skills.

Note: *There had been no comments on the operation of the engine and controls of the aircraft during the previous flights.*

Approximately at 16:20 (the pilot did not manage to report to the controller of "Dnipro-Information" about the time of takeoff) the plane took off. According to the information obtained from a private video camera being installed in the cockpit, during taxiing, take-off and maneuvering for the purpose of a forced landing, the pilot-instructor was piloting the aircraft being on the right pilot's seat. The son of the owner of the aircraft, who was in the left pilot's seat, easily held the levers of control of the aircraft and controlled the actions of the pilot-instructor.

After the takeoff, at the true altitude of 30 - 40 meters, probably, the engine shut down. The pilot-instructor, who flew the plane, made a sharp turn to the left with a large roll, presumably in order to land on the airfield of the departure with the course of the return takeoff.

After the turn, the plane lost speed and collided with the ground at a large angle.

After the crash of the aircraft, its owner and the airfield manager, who observed the crash, immediately went to the scene of the fatal accident.

They evacuated the pilots and provided them with the initial assistance. At this time, a fire broke out on the plane.

At 16:46, the airfield manager called up "Dnipro-Information" controller and reported on the fatal accident which took place at "Kamyanka" airfield and notified the law enforcement and SSES authorities about the fatal accident.

The fire on the aircraft was extinguished by SSES means.

The medical service could not save the lives of the pilots, they died when the plane crashed.

The terrain where the fatal accident took place, is plain, its altitude over the sea level is + 70 meters, the coordinates of the scene of the fatal accident are: 48˚33'15"; 35˚01'06".

1.2. Injuries

Injuries	Crew	Passengers	Other persons
Fatal	2	0	0
Serious	0	0	0
Light/ no injuries	0/0	0/0	0/0

1.3 Aircraft damages.

The aircraft is completely destroyed.

Picture 1

1.4 Other damages.

There is no other damages.

1.5 Personnel information.

a) crew data:

Position	Pilot of the AC
Sex	Male
Date of birth	01.03.2001
Training (education)	«Western Ukrainian Aviation College» Ltd., 2019
Total flying hours	150 hrs
Total flying hours as PIC	140 hrs
Total flying hours on the AC type	102 hrs
TFH on the fatal accident date of 01.05.2020	Approx, 1 hr
Total flying hours in 2020	15 hrs
Метеоminima	*******
Number and validity period of the pilot's license	Private pilot license PA № 016985, Validity period till 17.10.2021
Medical certificate	Class 2 MC №066850, valid until 31.08.2022
Date of qualification check	08.09.2019
Date of line check	08.09.2019

Position	AC Pilot instructor
Sex	Male
Date of birth	19.03.1960
Training (education)	Secondary, Vovchansk ACP 1984
Total flying hours	5392 hrs
Total flying hours as PIC	4722 hrs

Total flying hours on the AC type	******
TFH on the fatal accident date of 01.05.2020	Approx, 1 hr
Total flying hours in 2020	*******
Метеоминима	200 x 2000
Number and validity period of the pilot's license	Private pilot's license PA № 011154, Valid until 28.11.2020
Medical certificate	Class 2 MCH №008251, valid until 19.12.2020
Date of qualification check	20.03.2019, FTO «Kharkiv aeroclub named after V.S. Gryzodubova ТСОУ»
Qualification marks	Single engine , FI, FE, FIE

Line maintenance was carried out by:

The pre-flight aircraft maintenance had been carried out by the owner of the aircraft and his son (the pilot).

1.6 Aircraft information.

1. **Type — GRUMMAN AA-5**

2. State and registration marks - UR-DCJ.
3. Serial number AA5-0546
4. Ownership – a private AC
5. Manufacturer - Grumman American Aviation Corporation plant
6. Date of manufacture — 24.05.1974
7. Resources and service periods:
   - Assigned resource – by the condition;
   - Overhaul resource – 7250 hours.
   - Operating time since the beginning of operation – 1290 hrs.
   - Number of overhauls – 0;
8. Airworthiness information:

- Registration Certificate № РП 4074 issued on 27.09.2013 by State Aviation Service of Ukraine.
- Flight Operation Permit issued on 02.03.2020 State Aviation Service of Ukraine. Validity period till 01.03.2021.

Engine

Engine type - Lycoming O-320-E2G
Serial number RL-32435-27A
Operating time since the beginning of operation – 644 hrs
Number of overhauls – 0
Resource remaining before overhaul – 1356 hrs

1.7 Meteorological information

At the time of the fatal accident, according to information received from the Ukrainian Hydrometeorological Center, no dangerous weather phenomenae were observed by the meteorological stations being located close to the scene of the fatal accident.

Scheduled weather METAR code reports on Dnipro airfield on 01.05.2020

At 12:00 UTC Ground wind direction is 250º, speed is 5 m/s.; the wind changed its direction from 210º to 290º Total amount of clouds is 6 points with a height of the lower limit of 600 - 1000 meters, cumulus and stratocumulus ones. Visibility is more than 10 km. Air temperature is 24ºC, dew point temperature is 5ºC. The pressure at the station is 1008 hPa. The barometric trend over the next two hours without significant changes.

At 13:00 UTC Ground wind direction is 240º, speed 5 m/s.; the wind changed its direction from 190º to 280º There are no special phenomena. There are no powerful cumulus and cumulonimbus clouds, the height of the lower limit is above 1500 meters. Visibility is more than 10 km. Air temperature is 24ºC, dew point temperature is 5ºC. The pressure at the station is 1008 hPa. Barometric trend over the next two hours without significant changes.

1.8 Navigational aids

The flights were performed by VFR, the navigational aids were not applied.

1.9 Communications

01.05.2020 PIC did not submit a preliminary flight plan. Before the beginning of the flights, he contacted the Air Force of the Armed Forces of Ukraine and the FIR Sector Dispatcher of the Dnipro ATS and he was in touch with him during the flights.

Note: *According to item 3.14 (Article 24) of the Instruction on the performance of flights in the area of "Kamyanka" airfield "In case of the performance of flights of aircraft outside the controlled airspace of ATS an inquiery on the terms of runway use shall no be made by the users".*

Note: *Extracts of communications between the controller of the FIS sector of the Dnipro ACC and the pilot of the aircraft, provided by UkSATSE, are in the materials of the investigation.*

1.10 Aerodrome information

The flights were performed from "Kamyanka" airfield (city of Dnipro), which operator is the NGO "Aviation Club " Dnipro ". The Instructions for flying in the area of "Kamyanka" airfield is approved by the Chairman of the Board of the NGO "Aviation Club "Dnipro" and agreed with the Acting Chairman of SASU on 03.12.2015.

1.11 Flight recorders

The Grumman AA-5 is not structurally equipped with flight parameters recorders.

The owner by himself installed a video recorder to monitor the operations of the crew members in the cockpit of the Grumman AA-5 UR-DCJ aircraft.

1.12 Wreckage and impact information.

The plane collided with the ground almost vertically. The scatter of the wreckage is 14 meters. The cockpit is destroyed. The engine is detached and is in front of the cockpit. The propeller is connected to the engine. One propeller blade is bent and the other one is intact. After the plane crashed, it caught fire. As a result, for the fire the aircraft engine and the cockpit were burned up.

Picture 2

The root part of the left wing (at the location of the fuel tank) is completely burned, the root part of the right wing has marks of burns. The fuselage of the plane burned down. The tail of the plane burned up.

Picture 3 (damage to the propeller)

1.13 Medical, pathological and anatomical information.

The examinations of the victims were conducted in the premises of the Dnipropetrovsk Regional Bureau of Forensic Medical Examination in the period from May 2, 2020 to May 22, 2020.

Note: *a copy of the expert's conclusions №852 and №853 are attached to the investigation materials.*

According to the results of forensic medical examination, the cause of death of the pilots were blunt force head injuries, which were accompanied by multiple fractures of the facial bones and of the skull, multiple injuries of internal organs, which led to acute anemia, anemia of the internal organs and a traumatic shock.

Forensic and toxicological examination of the pilots' blood revealed no ethyl alcohol or drugs.

1.14. Fire.

After the plane crashed, it caught fire. The fire burned the plane by about 80%.

1.15 Survival factors.

According to a phone call from the manager of "Kamyanka" airfield (city of Dnipro) on May 1, 2020 at 16.20 local tim, the duty ofiicer of CA CRCC received information about the aviation incident with the Grumman AA-5 UR -DCJ aircraft, which happened on "Kamyanka" airfield.

An SSES rescue team and an ambulance were called to the scene.

There were engaged 2 SSES fire brigades from Aviation SRFM (SR) and 2 ambulances, as well as 4 workers of the "Kamyanka" SR airfield.

1.16 Tests and examinations.

The Investigation team sent the Lycoming O-320-E2G engine, serial number RL-32435-27A, which at the time of the incident was installed on the plane to Chernihiv Higher Aviation School LLC, which has got a certificate for maintenance of the engines of this type.

From 02.06.2020 to 03.06.2020 the technical commission inspected the technical condition of the engine and its components and it was found that the technical condition of the engine Lycoming O-320-E2G, serial number RL-32435-27A did not affect its performance and at the time of the fatal accident. was technically serviceable.

Note: *The Technical Protocol of the inspection of the technical condition of the engine and its components according to the Technical Assignment of May 29, 2020 is attached to the investigation materials.*

Other tests and examinations were not carried out.

1.17 Information about the organizations and the administrative activities being involved into the fatal accident.

The owner of the aircraft is a private person.

The location base is "Kamyanka" airfield (city of Dnipro), being operated by the Public Organization "Aviation Club" Dnipro ", approved by the decision of the Executive Committee of the City Council № 1200 from 26.11.2019.

1.18. Additional information

Additional information is not available.

1.19. New techniques which were applied during the investigation

Standard investigational techniques were applied.

2 Analysis

In analyzing the circumstances of the fatal accident, the investigation team used the following materials:

- explanatory notes of witnesses and other persons involved in the occurrence;
- operational and flight documentation;
- information from ATS services;
- meteorological information;
- the results of the inspection of the scene of the fatal accident and the location of the structural elements of the aircraft at the scene of the fatal accident.
- the sketches of the scene of the fatal accident;
- the materials of the forensic medical examination;
- the materials of the Technical Protocol of checking the condition of the aircraft engine after the fatal accident;
- the information obtained from the video surveillance equipment located in the cockpit.

During the investigation, the investigation team found that the actual weather and weather forecast on 01.05.2020 in the area of "Kamyanka" airfield corresponded to the conditions of VFR flights: surface wind direction 250º, speed 5 m / s. ; the wind changed its direction from 210º to 290º Total number of clouds was 6 points with a altitude of the lower limit of 600 - 1000 meters, cumulus and stratocumulus. Visibility was more than 10 km. Air temperature was 24ºC.

The investigation team found out that at the time of the fatal accident, the AC pilot had a valid Private Pilot License, the validity of the license was until 17.10.2021, the pilot - instructor who was in the cockpit had a valid Private Pilot License, the validity of the license was until13.12.2020, and having ratings of FI, FE, FIE.

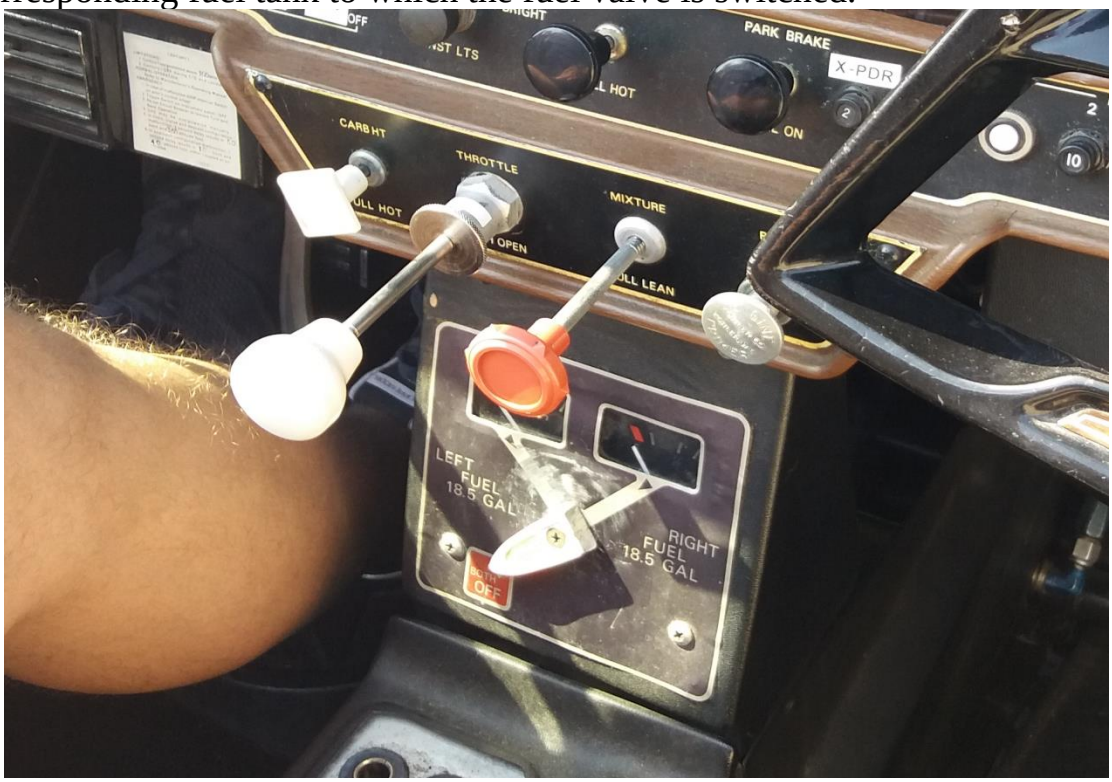
The Grumman AA-5 UR-DCJ aircraft had valid Registration Certificate and Release to Operation at the time of the incident.

The examination of the wreckage revealed that one propeller blade was bent and the other intact. This indicates that the propeller was in self-rotation mode when it collided with the ground (ie, the aircraft engine was not running).

During the inspection of the crash site, the team found out that the scatter of the wreckage was 14 meters, the root part of the left wing (where the fuel tank is) burned almost completely, and the root part of the right wing (where the fuel tank is also located) has insignificant consequences of external burning. The radius of the scattering of wreckage indicates of an almost vertical collision of the aircraft with the ground.

The team believes that there was probably no fuel in the fuel tank of the right wing.

The fuel valve in the cockpit is located at the bottom of the central control panel. The fuel system does not have an audible alarm as for the end of fuel from the corresponding fuel tank to which the fuel valve is switched.



Picture 4 (location of the fuel valve on Grumman AA-5 aircraft)

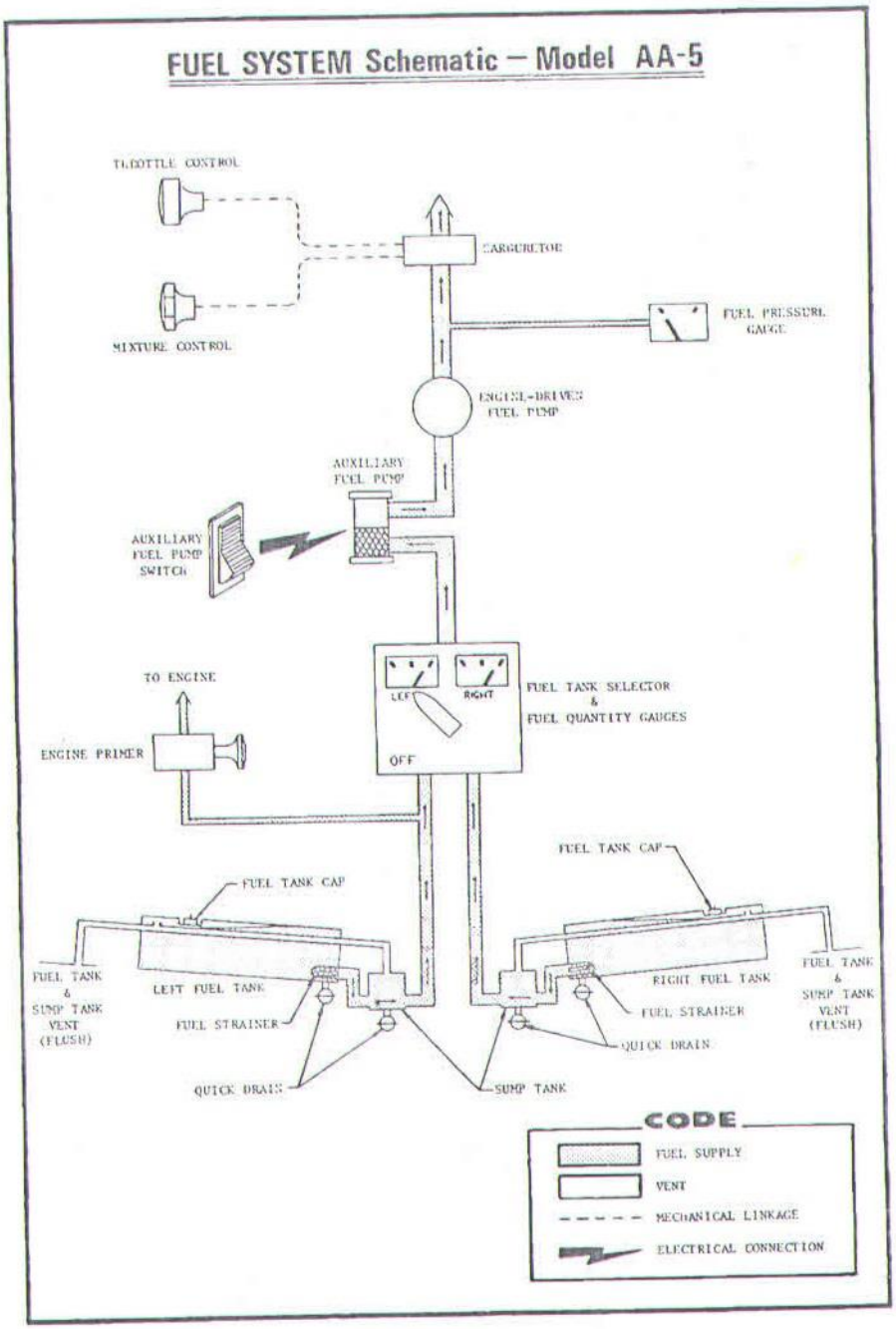


Figure 1

1–4

Layout of the fuel system of Grumman AA-5 aircraft)

Note: *according to the design of the fuel system of the Grumman AA-5 aircraft, the fuel valve switches the fuel supply to the fuel pumps of the engine either from the right fuel tank or from the left one, the function of fuel supply to the engine simulteneously from the both tanks is not available.*

Picture 5 (section of the engine instruments of Grumman AA-5 aircraft)

The investigation team conducted an examination of the technical condition of the Lycoming O-320-E2G engine, serial number RL-32435-27A, which was installed on the aircraft at the time of the fatal accident. The examination was performed at Chernihiv Higher Aviation School LLC, which has got a certificate for maintenance of engines of this type.

The examination found that at the time of the fatal accident, the engine was technically serviceable and operational.

The investigation team reviewed the rocordings from the video camera installed in the cockpit. It is clear from the video recording that the propeller rotations changed during the climb (the investigation team believes that the propeller speed dropped, probably due to the shutdown of the aircraft engine).

Subsequently, the members of the investigation team observed the following actions of the crew: the right pilot, who flew the plane on the takeoff, makes a sharp turn to the left with a descent, while the pilot on the left pilot seat instantly pulls the hand down under the control panel, where the switch valve of fuel tanks is located.

When inspecting the fatal accident scene, the team found that the plane crashed in front of the forest strip (Picture 3) which is in the end of "Kamyanka" airfield, behind the forest strip were LET wires followed by a plowed field were located.

Picture 6 (place of the aircraft impact with the ground)

Taking into account the identified circumstances and the information obtained during the investigation, the investigation team concluded that the events **most likely** occurred as follows: the last flights were performed with the fuel valve switched to the right tank. During the next flight, due to the exaustion of fuel in the tank of the right wing, its supply to the engine ended and it shut down.

Note: *according to the AOM of the Grumman AA-5 aircraft, before takeoff (Articles 2-4), the fuel valve switches to a fuller tank.*

Considering that landing in front of him could lead to the destruction of the plane, the pilot who flew the plane, in order to save the plane, decided to land on "Kamyanka" airfield with a course being opposite to the takeoff. The recording of a video camera installed in the cockpit shows the pilot, who was on the left pilot's seat, trying to switch the fuel valve to another fuel tank.

The investigation team believes that the right fuel tank (to which the fuel valve was switched) ran out of fuel, was run out of fuel, its supply to the engine stopped, due to which the engine stopped its operation.

Picture 7 (the field, a possible location of the forced landing)

3 Conclusions

3.1. Findings

1. The pilot had a valid private pilot's license.
2. The instructor pilot had a valid private pilot's license and ratings: single-engine, FI, FE, FIE. flights.
3. The Grumman AA-5 UR-DCJ, at the time of the fatal accident, had a valid Registration Certificate and Release to Operation.
4. Grumman AA-5 UR-DCJ aircraft flights on 01.05.2020 to "Kamyanka" airfield were performed in accordance with the Air Code of Ukraine, the Regulations on the use of airspace of Ukraine (CMUR № 954) and the Instructions for flights at "Kamyanka" airfield.
5. The engine of the aircraft at the time of the incident was in good operational condition.
6. The pre-flight training of the aircraft was performed by the owner of the aircraft and his son (the pilot).
7. The actual weather and the weather forecast were fit for VFR flight conditions.
8. Most likely, upon the collision of the aircraft with the ground, the aircraft engine did not operate, and the propeller was in self-rotation mode.

3.2. Cause

The investigation team believes that the most probable cause of the fatal accident of the Grumman AA-5 UR-DCJ aircraft was the engine shutdown during the climb after the takeoff, due to the complete consumption of fuel from the right fuel tank.

The contributing factors became:

- The improper control of the fuel consumption from different tanks, which resulted in untimely switching of the fuel valve from the right tank to the left one;
- The pilot's decision-making to return to the aerodrome of departure, despite of the low altitude, instead of performing a forced landing in front of him.

Factor: human (PIC-instructor, PIC)

Category: FUEL, CFIT.

3.3. Recommendations

3.3.1 Operators of the Grumman AA-5 aircraft should take into account the peculiarity of the aircraft's fuel system during the operation (impossibility to supply fuel to the engine from the left and right tanks at the same time) and permamently monitor fuel consumption by the tanks..