AIR ACCIDENT INVESTIGATION & AVIATION SAFETY BOARD

ACCIDENT REPORT
OF THE A/C 4X-CWN
AT Mt. AINOS OF KEFALONIA
28TH APRIL 2009

Report no 02 / 2011

MINISTRY OF INFRASTRUCTURE, TRANSPORT AND NETWORKS

HELLENIC REPUBLIC
MINISTRY OF

AIR ACCIDENT INVESTIGATION & AVIATION SAFETY BOARD (AAIASB)

AAIASB

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ACCIDENT INVESTIGATION REPORT
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at Mt. AINOS of Kefalonia on
28TH April 2009

The incident investigation was carried out by the Accident Investigation and Aviation Safety Board in accordance with:

- **ANNEX 13**
- **Regulation (EU) No 996/2010**
- **Hellenic Republic Law 2912/2001**

The sole objective of the investigation is the prevention of similar accidents in the future.

The Accident Investigation and Aviation Safety Board

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Captain Akrivos D. Tsolakis

Members
Stratos Giannakoulis
Captain

Spyrogiannis Dionysatos
Attorney

Dimitris Michalopoulos
Electronic Engineer

Secretary
John Papadopoulos

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OPERATOR	**: Private Owner**
REGISTERED OWNER	**: Private Owner**
MANUFACTURER	**: CIRRUS AIRCRAFT**
COUNTRY OF MANUFACTURE:	**USA**
AIRCRAFT TYPE	**: SR22**
NATIONALITY	**: ISRAEL**
REGISTRATION	**: 4X-CWN**
PLACE OF ACCIDENT	**: MT. AINOS of KEFALONIA**
DATE AND TIME	**: 28.04.2009, 16:57**
NOTE	: All times is UTC (Local time = UTC+3h)

Synopsis[1]

Two Cirrus 22 type aircraft (registration 4X-CWN and 4X-CWO) arrived from ISRAEL at Kos National Airport on 28.04.09 at 09:18 h. After about 3 hours both aircrafts (a/c) took off with Kerkira as their destination. En route, while at 9,000 ft, they encountered icing conditions. Aircraft 4X-CWO returned and landed in Athens, while a/c 4X-CWN that preceded, landed at Zakinthos airport at 15:11 h.

Next, the pilot of a/c 4X-CWN submitted a VFR flight plan to Kerkira and took off at 16:44 h. At 16:51:50 h the pilot reported his position as 91 nm from Kerkira and at 16:56:11 h he was returning to Zakinthos. The pilot's wife who was on board the aircraft responded "just a minute please" to two calls from ATC at 16:57:16 h and 16:59:14 h, sounding obviously stressed. After that, despite continuous calls by ATC, there was no further response from the a/c. The sound emitted from an Emergency Locator Transmitter (ELT) was headed on the emergency frequency of the Airport of

[1] *This report has been translated and published by the Hellenic Air Accident Investigation and Aviation Safety Board. As accurate as the translation may be, the original text in Greece should be considered as the work of reference.*

Kefalonia at 17:01 h, and ceased after 2 minutes. The wreckage of the a/c was located at 05:30 h on 29.04.09 on a mountainous region of Mt. Ainos of Kefalonia which was hard to access, at an altitude of 4.460 ft.

The Hellenic Air Accident Investigation and Aviation Safety Board (AAIASB) was notified of the accident at 21:00 h on 28.04.09 and with its decision AAIASB/621/29.04.09 assigned an Investigation Team with J. Papadopoulos, Investigator as IIC, and N. Pouliezos, Investigator, P. Tziritis, Air Traffic Controller, L. Loukopoulou, Human Factors specialist. Members of the team arrived at the site of the accident at 08:30 h on 29.04.09.

Notification about the accident was sent to Israel (country of registration), the USA (country of manufacture of the a/c) and the European Aviation Safety Agency (EASA). Mr. Itzhak Raz, Chief Accident Investigator, was designated as the accredited representative from Israel. He was notified about the accident at 21:30 h on 28.04.09 and arrived at the site of the accident on the morning of 29.04.09. The Investigation Team waited until he arrived in the site and then evacuated the bodies.

The draft final report was send to the Israeli Aircraft Accident Investigation Office and to NTSB for their comments as per Annex 13 of Chicago Convention. The comments from them were taking into account in the report.

1 Factual Information

1.1 History of the flight

1.1.1 Flight Preparation

The pilots of the two a/c, who had flown together on a number of occasions in the past, had planned to fly from TEL AVIV (Israel) to ELBA (Italy), to take part in the annual Cirrus Owners and Pilots Association (COPA) meeting that was taking place from 1 to 3 May and were going to attend COPA's Critical Decision Making seminar.

Three days before the accident, the two pilots met for a few hours with their instructor on a/c type Cirrus 22 whom they continued to consult even though they had completed their training.

According to the instructor, during the meeting they discussed the trip route, ground services at each destination, emergency situations and the actions each would require. The accident aircraft pilot had electronic (Jeppview) versions of IFR charts and Approach plates, was not equipped with VFR charts, and was accessing charts using a laptop computer and the a/c equipment.

The instructor advised them to avoid flight into icing conditions and VFR flight into marginal conditions, even though the entire preparation concerned IFR flying and the instructor was under the impression that no VFR flights would be taking place.

1.1.2 The flight TEL AVIV – KOS

The two a/c took off from the TEL AVIV (SDE-DOV/ISRAEL) International Airport at 05.30 h on 28.4.09 with KOS International Airport as their destination. Their flight plan included, after Kos, landing at Kerkira. On board a/c 4X-CWN were the pilot and his spouse who also possessed a private pilot's license. On board a/c 4X-CWO were the pilot and two passengers.

The two a/c took off only a few minutes apart from one another and while the flight of 4X-CWO was going to be conducted using Instrument Flight Rules (IFR), that of 4X-CWN was going to be conducted using Visual Flight Rules (VFR).

First to contact the KOS APPROACH control was the pilot of a/c 4X-CWO at 08:45 h who, while 32 nm from the Kos VOR, requested an approach using the KOS/VOR. The other aircraft (4X-CWN) made contact at 08:52 h while 35 nm southeast of Kos at an altitude of 6,000 ft.

The approach proceeded normally and the two a/c landed at Kos airport at 09:10 h and 09:18 h, respectively.

During their stay at the airport they received fuel. Aircraft 4X-CWN received 183 L of fuel. Next, they received weather information and submitted an IFR flight plan to Kerkira on the KOPAR - L995 – KRK route.

1.1.3 The flight KOS - ZAKINTHOS

At 12:07 h the pilots of the two a/c made contact with the Tower controller who informed them that Eurocontrol had changed the route they had requested to Kerkira.

They were given a new route which was GILOS – BRAVO 34 – ARA/VOR - H51 – KESAL – KERKIRA, FL100 (Appendix A). The pilots of the two a/c read back the route and at 12:17 h (a/c 4X-CWN) and at 12:20 h a/c (4X-CWO) requested to start up. Before takeoff, Tower repeated the new route that the two pilots would be following and they, in turn, read it back.

Aircraft 4X-CWN took off at 12:31 h while a/c 4X-CWO took off 9 minutes later at 12:40 h.

At 12:37:28 h a/c 4X-CWN was at an altitude of 5,500 ft and Kos ATC instructed the pilot to make contact with the Athens RADAR. At 12:39 h while crossing 6,500 ft, the pilot came into contact with the Athens RADAR (124,475 MHz), the aircraft was identified and the controller asked if the pilot's final altitude was going to be FL100.

The pilot responded that he would prefer a lower altitude, if possible. The controller initially gave him permission for FL90 and reminded him that after the MILOS/VOR he would have to climb to FL100. The pilot responded that he would climb to FL100.

At 13:05 h, because the route from DIDIMON/VOR to the reporting point NEMES crosses the Athens Terminal Area, the Athens RADAR controller asked the pilot to make contact with Athens Approach (132,975 MHz).

At 13:35 h the pilot, who had already crossed the MILOS/VOR made contact with Athens Approach, reporting at FL90.

At 14:05 h Athens Approach switched him back to Athens RADAR.

At 14:07:50 h, while 10 nm north of the city of Tripoli and 5 nm south of airway B34, the pilot contacted sector R7 of Athens RADAR, reported FL90 and asked to descend to FL70 because of the risk of icing. The controller informed him that the minimum flight altitude (meaning Minimum Flight Level) for the route that the aircraft was following towards ARAXO is FL100 and that he would have to climb to FL100, saying *"4X-CWN the minimum flight altitude on course to ARX is 100, so you have to climb 100."*

The pilot re-contacted the controller saying *"I would like to descend"* and, while the controller asked him if he wanted to turn back, the pilot reported *"that's correct Sir, I*

am in a risko icing" but continued on the same route and the controller gave him permission to descend to FL80.

At 14:14:50 h the pilot reported at 7,800 ft and requested permission for further descent to FL70. The controller reminded him that the minimum flight altitude was FL100 and allowed him to stay at the present altitude for the time being, while waiting for further instructions.

At 14:18 h the controller asked the pilot of the a/c, which was 25 nm towards the ARA/VOR, to climb to FL80 and, if possible, to continue the climb to FL90. The pilot responded that because of icing conditions he could not climb to FL90 and finally received permission to climb and maintain FL80.

At 14:23 h the pilot asked to continue to ARAXO – KERKIRA. The controller repeated that the minimum flight altitude is FL100, that there are mountains (in the region) and asked him to climb, if possible, to FL100.

At 14.37 h and while the a/c was about 30 nm from the ARA/VOR, the pilot asked if it was possible to land at Agrinio. The controller informed him that the Agrinio Airport was closed, and that the nearest airport was that of Kefalonia. The pilot, who reported that icing conditions no longer existed, requested and received the weather for Kerkira, which read: "*WIND FROM 030º, 3 kt, VISIBILITY 3 km, FEW AT 800' SCATTER AT 1800', CB SCATTER AT 2000', TCU BROKEN AT 1500', TEMPERATURE 12, QNH 10, DEW POINT 10 CORRECTION QNH 1008*". Responding to a question from the controller at 14.45 h if he was continuing on to Kerkira or not, the pilot stated that he was going to proceed to Kefalonia and asked for the Kefalonia weather. At that time, the a/c was over Lefkada, 45 nm from Kerkira. The controller informed the pilot that Kefalonia was closed and that his options were Zakinthos or Araxos. The pilot responded that he would go to Zakinthos and requested the Zakinthos meteorological report.

The controller gave him the report, which was: "*WIND FROM 180º, 20 kt, VISIBILITY 10 km, FEW AT 1000', FEW AT 1800', TCU SCATTER AT 3000', BROKEN AT 8000', TEMPERATURE 18, DEW POINT 12, QNH 1009*", the route that he would have to follow and, to a question whether he knew the Zakinthos airport

procedures, the pilot responded *"I have on the GPS the procedures but I do not have the levels."*

At 15:01 h the pilot reported being out of the clouds but that there were clouds at a lower altitude and he was still flying in IMC en route to Zakinthos VOR.

At 15:03 h he contacted Zakinthos Tower and at 15:10 h he landed at Zakinthos airport.

The pilot of a/c 4X-CWO, was following the same route, had passed the DIDIMON/VOR and was in contact with the Athens Approach controller, when he received, at 14:16 h, an instruction from ATC, who was aware of the report from 4X-CWN about icing conditions, to turn right 340º towards Kerkira. The pilot turned to that direction. At 14:34 h, he informed ATC that at FL100 where he was at that time there were icing conditions and asked for an immediate turn 180º towards a different destination with better conditions.

The controller gave him permission to turn 180º and the aircraft finally landed at the Athens International Airport.

1.1.4. The Flight ZAKINTHOS - KERKIRA

According to the Airport Operation Officer, after landing at Zakinthos, the pilot of 4X-CWN received the weather report from the Kerkira Weather Station over telephone and expressed his intention to depart with Kerkira as his destination. At 16:20 h he submitted a VFR flight plan for Kerkira. The route filed was ZAK – KFN – KRK, speed 160 kt, FL40 and flight duration 30 minutes.

Meteorological conditions at Zakinthos and Kerkira, according to ATC, permitted VFR flight and the pilot reported that he had received the weather for the route. The weather report at 15:50 h for Kerkira was *"06008KT 6000 – RA SCT008 FEW018CB SCT025 BKN080 12/11 Q1009 RETS RMK CB SE 18 KM."* The weather report at 16:00 h for Kefalonia was *"18012KT 9999 FEW018 SCT020 BKN080 17/14 Q1009."*

At the same time, the TAF for Kerkira were:

"*LGKR 281100Z 2812/2912 15020KT 9999 FEW020 SCTO30 BECMG 2818/2820 14010KT PROB40 TEMPO 2812/2912 6000 RA SCT015 BKN025 PROB30 TEMPO 2812/2818 3000 TSRA SCT006 FEW018CB BKN020=*" and

"*LGKR 281700Z 2818/2918 15020KT 9999 FEW020 SCT030 PROB40 TEMPO 2818/2824 6000 RA SCTO15 BKN025 PROB30 TEMPO 2818/2824 3000 TSRA SCTO10 FEW018CB BKN020 PROB40 TEMPO 2910/2915 6000 RA SCTO15 BKN025 BECMG 2910/2912 22010KT=*"

The a/c took off at 16:44 h and, to a question from Zakinthos Tower, at what altitude the pilot initially wanted to fly, he responded "*I would like initially to fly at 2,500 ft.*" At 16:46 h he reported 6 nm from the airport and Zakinthos Tower asked him to contact the Andravida Approach, under whose control was the region he would be flying over on his way to Kerkira.

At 16:47 h the pilot contacted Andravida Approach and reported being 8.5 nm from Zakinthos on the way to Kefalonia. The controller gave him the QNH and asked him to report 30 DME from Zakinthos.

Next, the pilot asked the Andravida controller if he was aware of any weather reports in that area "*Do you know a report weather in your area?*"

At 16:48 h the pilot contacted the controller again and asked "*where did you want us to report.*" The controller responded "*continue direct Kerkira, maintain 2,500 ft or report if you wish to climb.*"

At 16:49:24 h the Andravida controller reported the Kefalonia weather, saying: "*WIND FROM 170 DEGREES, 12 KNOTS VISIBILITY IS 5 KM, MIST, CLOUDS FEW, 1,500 FEET, SCT 1800, TCU, BKN 2,500, TEMPERATURE 17º C, 14 DEW POINT*".

The pilot confirmed receipt of the information and reported his position saying "*My position is right now 91 miles from Kerkira and my direction is 333°.*" The controller responded that Andravida only provides procedural control, does not have radar, and asked the pilot to report 30 nm from Zakinthos on course to Kerkira. The pilot's response was "*we will report 30 nm from Zakinthos.*"

From 16:51:06 h until 16:52:32 h, the Andravida controller talked with Preveza and was informed that the weather was poor 30 nm west of Preveza (i.e., in the region

between Kefalonia and Kerkira). At 16:52:45 h the controller repeatedly tried to contact the accident aircraft, without success.

At 16:53:30 h the pilot contacted the Andravida controller again saying "*I am going back to Zakinthos. My position is 25 miles North of Zakinthos.*"

At 16:54:46 h a female voice from the a/c was heard saying "*Just a minute please.*" At 16:56:25 h, on the Andravida frequency, but on a recording that was only captured by the recorders at the Zakinthos airport, a female voice was heard saying "*help, please.*"

At 16:56:27 h the Andravida controller called the a/c twice and at 16:56:45 h a female voice was again heard saying "*Just a minute please*" in an voice obviously stressed.

There was no response to the continued calls that ensued from Andravida to the a/c.

At 16:57:26 h, on the emergency frequency of Kefalonia Tower control, the sound emitted by an ELT was heard but ceased 2 minutes later. An alert and emergency phase was declared by ATHINAI ACC and a SUPER PUMA helicopter and a C-130 aircraft rushed to the area in search of the a/c.

At 21:30 h on 28.04.09 the scene of a small fire was located in a hard-to-access area of Mt. Ainos of Kefalonia by policemen who were conducting a ground search. A unit of the Special Forces of the Fire Fighting Services arrived from Patra on a C-130 a/c and, together with men of the Special Forces of the Hellenic Air Force, climbed in the above mentioned area and at 02:30 h on 29.04.09 located the wreckage of the a/c on the SW side of Mt. Ainos, on a hard-to-access area with coordinates 38° 08´ 05.29´´ B, 020° 39´ 43.65´´ E, an approximately 45% slope, and an elevation of 4,460 ft. Based on markings on the ground, the aircraft climbing impacted the ground in a NNE direction.

Photo 1

Photo 2

1.2 Injuries to Persons

Injuries	Crew	Passengers	Other
Fatal	**2**	**0**	**0**
Serious	**0**	**0**	**0**
Minor / None	**0 / 0**	**0 / 0**	**0 / 0**

1.3 Damage to Airplane

The aircraft was destroyed by the impact and the post impact fire (photo 2).

1.4 Other Damage

There was no other damage.

1.5 Personnel information

1.5.1 Captain

Male, 62 years old.

License : Private Pilot's License

Ratings : Single engine landplanes with Max TOW 12.500 LBS, obtained 17.04.01 (GROUP A).

Multi engine light piston aircraft, obtained 17.12.02 (GROUP B).

Instrument rating (GROUP A only), obtained 25.06.02

Flying experience : 666 h until December 2008, of which 417 h in SR 22 a/c as PIC, with 95 h of instrument flying. Recurrent flight check on SR 22: 02.02. 09. Periodical Instrument Rating check: 02.02. 09

Medical certificate : Class II medical certificate, valid until 15.05.09, with restriction of near-vision glasses.

According to the instructor, which flew with him a few times annually, the pilot had good flight abilities, was conservative in his decisions, without taking risks. He was flying regularly IFR, and had some experience in IMC flight conditions.

1.5.2 Copilot

Female, 60 years old.

License : Private Pilot's License

Ratings : Single engine landplanes with Max TOW 12.500 LBS, obtained 07.02.02 (GROUP A).

Flying experience : 303 h until May 2006, of which 60 h as PIC. Recurrent flight check on SR 22, 29.01.04.

Medical certificate : A valid Class II medical certificate.

According to the instructor, the copilot (and pilot's spouse) flew as PIC in national and international flights that the couple took in the past. He was not aware how much the spouse had been involved in planning for the accident flight but, based on his experience, the two pilots flew together often and he had heard from them about their excellent coordination skills in flight. The instructor stated that he did not know why the copilot did not keep her flight log up to date, but that he had administered a recurrent check to her himself in 2009.

1.6 Aircraft information

Manufacturer	:	Cirrus
Model	:	SR 22
S/N	:	1678
Date of Manufacture	:	2005
Registration	:	Aircraft registered with the Israel CAA on 01.03.06, Certificate No 1266.
COA	:	Last COA issued 11.03.09 – valid until 10.03.10

Engine	:	Continental 10-550-N
Propeller	:	HARTZEL type PHC – I3YF - IRF

1.6.1 General information

The Cirrus SR22 aircraft is a single engine, 4-seat aircraft that belongs in the Technically Advanced Aircraft (TAA) category. The U.S. Federal Aviation Administration (FAA) labels TAA any aircraft equipped with new-generation avionics that take full advantage of computing power and modern navigational aids to improve pilot positional awareness about weather and terrain. TAA are equipped with a moving-map display, an IFR-approved GPS navigator and an autopilot.

The SR22 goes beyond this classic definition to feature a "glass cockpit" that hosts two large, 10.4 inch diagonal displays (Figure 1). Displayed on the left is a Primary Flight Display (PFD) (replacing the traditional "six-pack" or round-dial mechanical instruments) is displayed. Displayed on the right is a multifunction display (MFD).

Figure 1

The accident aircraft had the following equipment on board:

- Autopilot (Sys 55X Autopilot Prgmmr)

- Entegrate suite: Avidyne Flight Max EX5000C MFD (Multi-Function Display) and PFD (Primary Flight Display)
- TAWS (KGP 560)
- GNS (Garmin) 430 (GPS/COM/NAV) (dual)
- GMA 340 Audio Panel
- Engine Monitoring (EMax)
- Stormscope
- Mode A/C Transponder

1.6.1.1 Primary Flight Display

The left display, directly in front of the pilot, is the PFD. It is actually split into two: the top half of the screen shows an electronic attitude direction indicator (EADI) display; the bottom half shows an electronic horizontal situation indicator (EHSI). In the center of the EADI is an attitude indicator, with standard bars and turn hashes and along the left and right sides are an airspeed tape and an altitude tape and vertical speed indicator (VSI), respectively.

The Primary Flight Display (PFD) combines indications of up to 9 individual round-dial gauges onto one screen, e.g., airspeed, altitude, heading, vertical speed, navigation source, and attitude indicator.

1.6.1.2 Multi Function Display

The right display in the center of the cockpit panel (to the right of the pilot), is the MFD. The MFD displays a variety of different pages of information. The pilot can select among: moving-map (including present position), engine-monitoring, checklists and performance, weather, traffic information, details of current trip, fuel, and other displays contingent upon optional equipment (e.g., charts and terrain awareness).

Example: MAP page (left) and WEATHER page (right)

The MAP page displays terrain elevation in color but, per the manufacturer's manual, is only of an advisory nature and should *not* be used for navigation.

TERRAIN page

The TAWS (Terrain Awareness Warning System) page on the EX5000C works with the EGPWS (Enhanced Ground Proximity Warning System). Any display of yellow or red on the TAWS page indicates an imminent terrain or obstacle hazard. If a terrain or obstacle alert occurs while a page other than TAWS is being displayed on the MFD, a terrain or obstacle alert message displays in the Message Bar.

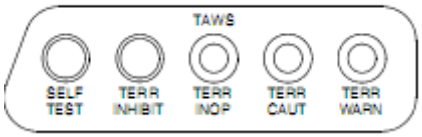
1.6.1.3 Terrain Awareness Warning System (TAWS) (KGP 560)

The accident aircraft was also equipped with a (Honeywell) KGP 560 Terrain Awareness/Warning System (Enhanced Ground Proximity Warning System – EGPWS). This system uses proprietary terrain, obstacle, and runway databases, and

GPS and altitude (not contingent on pilot entering an altimeter setting) data to provide Alerting and Warning functions. In addition to aural alerts, the system provides visual alerts which are displayed on the Garmin unit. Databases come in the form of a removable database card that must be installed by the pilot in the computer for proper operation. There are three databases (Americas, Atlantic, and Pacific) and it is up to the pilot to determine which database to purchase and install. The accident aircraft had been purchased with the Atlantic database which includes Greece and Israel.

According to the KGP 560 Pilot's Guide (Honeywell, Revision 7, Oct/2005), during normal flight operations, the system displays aircraft position relative to surrounding terrain and known obstacles. If the aircraft flies into an area where a conflict with terrain or other known obstacle is imminent, the system will provide both visual and aural warnings to the pilot. The system also provides a "look-ahead" function (independent of the Terrain Awareness Display), which compares the aircraft flight path to terrain and obstacle database information, and distance to known runways. When this function detects terrain one minute ahead of the aircraft, an aural alert "Caution Terrain, Caution Terrain" is given. The pilot must adjust the flight path as required away from the threat until the alert ceases. Should the aircraft continue toward the threat area, the alert will repeat approximately every 7 seconds. The pilot should take immediate action to adjust flight path away from the threat until the alert ceases. If the aircraft approaches to within about 30 seconds of a threat area, the alert message "Terrain Terrain, pull up" is given continuously.

Visual warnings are given on the Annunciation Panel.



Annunciation panel of the TAWS

If the TAWS is configured to display information on the MFD, the distance of the aircraft altitude from the obstacle is displayed using different colors:

- Green: the distance is safe

- Yellow: terrain is very near or above aircraft altitude – the aircraft does not have safe clearance
- Red: terrain is above aircraft altitude (at least 2,000 ft) – the aircraft does not have safe clearance and may not be able to escape this terrain.

According to the manufacturer, the system should be tested prior to a flight for proper operation, by pressing the self-test switch on the TAWS Annunciation panel, normally during the BEFORE TAKE-OFF check. This is not a checklist item but is mentioned as a supplement in the Cirrus POH (Pilot's Operating Handbook). Pilots are required to be familiar with these supplements.

1.6.1.4 GPS Garmin 430 unit

At the "heart" of the avionics system is the Garmin 430 GPS unit, which monitors aircraft position and routing. The GPSs also works to incorporate the additional features as the Terrain Awareness Warning System, Skywatch traffic avoidance, etc.

The pilot can select among a number of different screens of navigational, route/waypoint and airport information.

1.6.1.5 Other equipment on board

According to the pilot's instructor, the accident pilot used JeppView Manuals (electronic version of Jeppesen Airways Manuals), that can be read or printed out using a personal or laptop computer. According to the manufacturer, these editions are intended for use on the ground, and printing the necessary charts for a flight is recommended prior to flight. The manuals must be regularly updated by the pilot.

1.7 Meteorological Information

METAR LGKR

LGKR 281550Z 06008KT 6000 –RA SCT008 FEW018CB SCT025 BKN080 12/11 Q1009 RETS RMK CB SE 18 KM=

LGKR 281620Z 07008KT 9999 SCT008 FEW018CB SCT025 BKN080 13/11 Q1009 CB SE 20 KM=

LGKR 281620Z 07008KT 9999 SCT008 FEW018CB SCT025 BKN080 13/11 Q1009 BECMG TSRA=[2]

LGKR 281720Z 14006KT 9999 FEW008 SCT080 14/10 Q1009 RMK FEW 180=

TAF LGKR

LGKR 281100Z 2812/2912 15020KT 9999 FEW020 SCTO30 BECMG 2818/2820 14010KT PROB40 TEMPO 2812/2912 6000 RA SCT015 BKN025 PROB30 TEMPO 2812/2818 3000 TSRA SCT006 FEW018CB BKN020=

LGKR 281700Z 2818/2918 15020KT 9999 FEW020 SCT030 PROB40 TEMPO 2818/2824 6000 RA SCTO15 BKN025 PROB30 TEMPO 2818/2824 3000 TSRA SCTO10 FEW018CB BKN020 PROB40

TEMPO 2910/2915 6000 RA SCTO15 BKN025 BECMG 2910/2912 22010KT=

METAR LGKF

LGKF 281600Z 18012KT 9999 FEW018 SCT020 BKN080 17/14 Q1009=

LGKF 281700Z 19012KT 5000 BR FEW015 SCT018TCU BKN025 17/14 Q1009 RMK BKN080=

SPESI

SPGR 91 LGKF 281612

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[2] **Note**: After the first METAR was issued at 16:20 h with the remark CB SE 20 km, the National Weather Service issued immediately a new METAR with a 2 hour forecast of a trend for weather changes (TREND FORECAST), that a thunderstorm was expected at the airport (BCMG TSRA).

LGKF 281612Z 18011KT 5000 BR FEW015 SCT018 BKN025 17/14 Q1009 BKN080=

TAF LGKF

LGKF 281100Z 2812/2821 14015KT 9999 FEW015 SCT030 PROB40 TEMPO 2812/2821 6000 RA SCT010 BKN025 PROB30 TEMPO 2812/2818 3000 TSRA SCT008 FEW018CB BKN020=

LGKF 281400Z 2815/2824 16015G25KT 9999 SCT020 BKN080 PROB40 TEMPO 2815/2824 6000 RA PROB30 TEMPO 2815/2821 3000 TSRA SCT010 FEW018CB BKN020 BECMG 2816/2818 27015KT=

METAR LGZA

LGZA 281450Z 18016G27KT 9999 FEW010 FEW018TCU SCT030 BKN080 18/12 Q1009=

LGZA 281750Z 18012KT 7000 SCT008 FEW018TCU BKN030 16/13 Q1009=

TAF LGZA

LGZA 281100Z 2812/2821 14015KT 9999 FEW020 SCT030 PROB40 TEMPO 2812/2821 6000 RA SCT010 BKN025 PROB30 TEMPO 2816/2820 3000 TSRA SCT008 FEW018CB BKN020 BECMG 2816/2818 20015KT=

LGZA 281400Z 2815/2824 20015G25KT 9999 SCT025 BKN070 PROB40 TEMPO 2815/2824 6000 RA SCT015 BKN025 PROB30 TEMPO 2815/2821 3000 TSRA SCT010 FEW018CB BKN020 BECMG 2816/2818 27015KT=

1.8 Aids to Navigation

Both the Zakinthos and Kefalonia Airports are equipped with DVOR/DME. Kerkira is equipped with DVOR/DME, Approach RADAR, and ATIS.

During its flight from Kos to Zakinthos, the aircraft was provided ATC services from the ATHINAI ACC and Approach Centre and used the available navigational aids.

1.9 Communication

The joint investigation team (Greek and Israeli) carefully analysed the transmition and the telephone conversations between controllers and the communication with the a/c.

Communication between the accident a/c and the ground stations with which it came into contact was good, except during the flight segment from Zakinthos to Kerkira in which there were moments that the a/c and the Andravida Air Traffic Control Service were tried to communicate each other at the same time and there was a transmition blockage.

1.10 Aerodrome Information

Both the Zakinthos and Kefalonia Airports are inside the Andravida Terminal Area. Andravida Air Traffic Control Service provides procedural approaches to these airports. They are International Airports and their hours of operation change, depending on passenger traffic.

NOTAMS B0208/09 and B0171/09, respectively, define their hours of operation. According to them, on 28.04.09, the Zakinthos airport operated from 03:30 h until 04:30 h, from 07:30 h until 13:00 h and from 15:00 h to 17:30 h, and on 29.04.09 from 15:30 until 17:30 h.

On 28.04.09, the Kefalonia airport operated from 05:00 h to 06:30h and from 17:00 h to 18:45 h.

1.11 Flight Recorders

The a/c was not equipped with flight data recorders, as there was no such requirement. The PFD, MFD, and their electronic circuits, from which it might have been possible to extract information, were destroyed due to the fire which followed the impact with the ground.

1.12 Wreckage and Impact Information

The a/c impacted the SW side of Mt. Ainos in Kefalonia travelling in a NE direction, in a region at 4,460 ft of altitude and a 45° slope. Judging from the impact tracks it seems that the aircraft impacted the ground with the lower part of its fuselage and, given the great slope of the ground, it was deduced that it was on a climb with a high angle of attack**.** After the impact, and without any wreckage dispersion, the aircraft slid uphill for a short distance and then, because of the slope of the mountain, slid backwards. Its sliding motion stopped when the lanyards of the parachute with which it was equipped (Cirrus Airframe Parachute System – CAPS) became entangled in a bush. Based on the fact that the lanyards had extended while the canopy of the parachute had not deployed, it is concluded that the parachute mechanism was energised due to the impact with the ground.

1.13 Medical and Pathological Information

The bodies of the two aircraft occupants were heavily burned and their limbs were burned to ashes. The forensic examination revealed no evidence of alcohol or other substances. The occupants' death was caused by injuries compatible with impact of the aircraft with the ground.

1.14 Fire

A fire started after the impact which totally destroyed the cockpit and the main part of the fuselage. The fire burnt for a long time because at 21:30 h, 4 hours and 30 minutes after impact, there was still a small fire (the one that policemen searching the area discovered).

1.15 Survival Aspects

Both aircraft occupants were found in their seats in the cockpit. The release mechanism of their seat belts was still engaged while the belts had been burned out. The pilot's spouse was found in the left seat in the cockpit.

1.16 Test and Research

A simulation flight, using a Cirrus SR22 aircraft with the same equipment on board as the accident a/c, was flown. The flight followed the initial route of the accident a/c towards Kerkira, and at the location where it is estimated that the pilot decided to return to Zakinthos, the option "GO TO ZAKINTHOS" was selected on the autopilot. The aircraft turned right and followed a South direction, keeping the main bulk of Mt. Ainos on its left and at a very small distance.

1.17 Additional Information

1.17.1 Earwitness Statements

At the foot of the mountain on which the a/c impacted the ground lays a small village, residents of which heard the sound of the aircraft's engine. The village is at an altitude of 300 ft and at a distance of about 3.5 km SW from the point of impact.

The statements of four residents that heard the sound coincide in that: they describe having heard, at about 20:00 h (UTC 17:00) on 28.04.09, the sound of the engine of an a/c flying low over the village. The sound could be heard for a total of about 5 minutes, and at times louder, at times weaker. The area was cloudy and foggy at that time, which is why, despite the fact that they could hear the a/c, they could not see it. Everyone had the impression that there was some kind of a problem and wondered why the a/c was flying so close to the mountain.

1.17.2 Cirrus Training Program

According to the Cirrus Flight Operations Manual, Cirrus pilots should satisfactorily complete the Cirrus Transition Training Course or the Cirrus Standardized Instructor Program (CSIP) course prior to acting as pilot in command of a Cirrus aircraft.

Cirrus pilots should complete recurrent training at a Cirrus Standardized Training Centre (CSTC) or with a Cirrus Standardized Instructor (CSI) under the guidance of the Cirrus Pilot Learning Plan. Recurrent training emphasizes aeronautical decision making, risk management, and airmanship, which leads to increased proficiency.

Instrument rated pilots should complete an instrument proficiency check every 6 months.

After two fatal accidents in January 2003, the Cirrus Owners and Pilots Association (COPA), together with Cirrus Design and insurers developed training courses and materials aiming to improve pilot safety, training and decision making.

The COPA Critical Decision Making (CDM) seminar is highly interactive, free, half-day seminar that take an intensive look at general aviation safety, analysis of past accidents - including some Cirrus accidents - and creates a formal method of conducting individualized safety routines for each pilot.

The Cirrus Pilot Proficiency Program is a weekend event for Cirrus owners and their partners that focuses on Cirrus-specific knowledge and flying proficiency, including a module that focuses on Single Pilot Resource Management. The Program is held throughout the USA and in Europe, and offers both ground and flight sessions with seasoned certified Cirrus Standardized Instructor Pilots. (Options for Flight only, Ground only, Flight & Ground, partner in command, recurrent training).

After purchasing the a/c, the accident pilot completed the first training program, the Cirrus Transition Training Course.

1.17.3 Data Analysis of Other Accidents with Cirrus SR-2X Aircraft

From the year of manufacture of the Cirrus SR20 in 1999 until 2009, 55 accidents involving SR-2X aircraft have been recorded world-wide (data are available on the COPA website). The pilot was listed as a probable cause in 97% of those (of a total of 37 reports that have determined possible causes). Most (75%) of the pilots involved were high-time pilots (400 hrs) but only 18% had significant time (>400 hrs) in the SR2x (31% of those had between 150 and 400 hours, while 44% had less than 150 hrs on the type) . More than half (58%) of the pilots had an instrument rating. Slightly more than half (54%) of the accidents occurred in IMC, while 38% overall accidents were being flown in IFR. Of special interest is the fact that almost 24% overall accidents involved VFR flights during which pilots, while flying VFR, found

themselves in IMC conditions (implying a loss of situational awareness). Similarly, 38% of the accidents involved IFR flying in IMC conditions (implying a lack of proficiency).

1.18 Useful or Effective Investigation Techniques

Not Applicable.

2 Analysis

2.1 Pilot

The pilot remained in contact with his flight instructor, even after having completed his training, and sought his advice in planning the long trip to Italy. This shows a conscientious pilot who, while experienced, recognizes the value of additional suggestions that another, more experienced pilot, can offer. Despite that, it is noteworthy that the instructor was given the impression that no VFR flights would be flown on this trip.

2.2 The Flight Tel Aviv – Kos

Given that the aircraft took off from Tel Aviv at 05:30 h, the accident pilot and his spouse must have woken up at 04:00 h, if not earlier. Such an early rising time was probably not something the 62 year old pilot and his spouse were used to, and must have given some desynchronization of their circadian rhythm. After a 4 hour VFR flight in an unfamiliar environment, the pilot remained on the ground at Kos for 3 hours. At 12:31 h when the aircraft took off from Kos for the second leg of the 2:40 h long trip, the pilot had already been awake for eight and a half hours.

2.3 The Flight Kos – Zakinthos

Even though the Eurocontrol-imposed change to the submitted flight plan did not bring about large changes to the route that had been requested, the flight level change from the initially-requested FL80 to FL100 led to the danger of icing for the a/c, a fact that undoubtedly increased the workload and stress level of the pilot. Eight minutes

after takeoff, and while the aircraft was at 6500 ft and climbing, the pilot, afraid of encountering icing conditions, requested a lower altitude than the FL100 he had been cleared to, and was cleared to FL90 until the MIL/VOR. At 14:07 h and while the a/c had crossed the MIL/VOR and continued to fly at FL90, the pilot reported the danger of icing and insisted on descending to FL70, even though ATC clarified that the Minimum Flight Level (or as was stated by the controller, minimum flight altitude) for the route to the ARAXOS VOR was FL100. When, after his persistence and the danger of icing that the pilot reported to be facing, the controller asked him if he wished to return, the pilot replied *"that's correct Sir, I am in a risko icing."* He continued, however, along the same route and the controller finally gave him clearance to descend to FL80. The manner in which this non-professional pilot with limited IFR flying experience handled this situation shows a rather aggressive stance and persistence in fulfilling a goal, despite all difficulties. The pilot of the other a/c (4X-CWO), who was flying with him and also encountered icing conditions made a full reversal and landed in Athens.

The controller's action who, faced with the icing danger being reported by the pilot and the latter's persistence to continue on with the flight, yielded and allowed a flight below the Minimum Flight Level of the airway BRAVO 34, was not the prescribed action and generated risks.

At 14:37 h, the pilot, despite declaring that he was no longer facing icing conditions and despite the fact that Zakinthos was declared as his alternate on this flight plan, asked to land at Agrinio. He did not mention the reason for his decision. The Agrinio airport is a military airport and requires a minimum of 48 hours prior warning and special permission to accept a/c, unless of course an a/c is facing an emergency. The controller informed the pilot and told him that if he wanted to land, the closest airport was that of Kefalonia. The pilot continued on his North route towards Kerkira, asked for the weather report at Kerkira, and while 45 nm form Kerkira, at 14:45 h, declared he was returning to Kefalonia.

Even though the pilot again did not mention the reason for deciding to return, since there was no danger of icing any longer, it was most likely the weather report that he was given for Kerkira, or the weather he was facing, that made him decide to return to Kefalonia, even though he was 45 nm from Kerkira and 93 nm from Kefalonia.

Fatigue may have also played an important role in the pilot's decision. At the time he made the decision to return to Kefalonia, he had been awake for 11 h – and the stress of having flown for quite some time under the threatening conditions of icing had undoubtedly added to this fatigue. In addition, the time frame during which all of this was taking place coincides with a low time in a person's circadian rhythm, meaning that anyone, especially someone whose sleep cycle has already been disrupted, is likely to be most sleepy. It is therefore possible that the pilot felt he was no longer inclined and/or capable of facing the difficult conditions and opted for finding himself again on the ground to rest, or at least to change environments for a while and recuperate.

Three minutes after the change in his route towards the south, in order to land at Kefalonia, the controller informed the pilot that the Kefalonia airport was closed and suggested he might land in Zakinthos which was 28 nm further south on his route, and gave him information relevant to the approach and landing. The pilot stated that he had the procedures on the GPS but not the levels. This statement likely refers to the fact that, while the pilot had declared Zakinthos as the alternate airport, he did not have the approach charts for Zakinthos available, as all approach charts were on the laptop and he may have felt that there was not enough time to retrieve them. The charts on the GPS are partial descriptions of instrument approaches and not approved for IFR navigation.

At 15:10 h the pilot landed in Zakinthos. By this time, he had been awake for twelve hours, the last three of which were flying under stressful conditions.

2.4 The Flight Zakinthos – Kerkira

2.4.1 The Decision to Fly

According to NOTAM B0208/09, on 29.04.09 the Zakinthos airport would be opening at 15:30 h. It is possible that the pilot was informed about this after landing at the airport. During his stay on the ground, for about 1.5 hours, the pilot used the telephone to contact the weather station at Kerkira airport.

When submitting his flight plan, the pilot reported having received the weather for his route. The route filed was ZAK – KFN – KRK, the speed 160 kt, FL40, flight duration 30 min, and the name of the pilot as the PIC. At that time, and even though the weather report of Kerkira technically permitted VFR flight, the conditions were not ideal for flying in an unfamiliar area. Weather reports, of course, are best understood and appreciated in conjunction with terrain information. The pilot's decision was probably too optimistic and raises questions about his preflight planning. According to the pilot's instructor, the pilot was flying with VFR charts on a laptop. Presumably, these were used to plan the flight ahead of time, while on the ground. The other important source of information, however, which was the terrain display on the MFD and the database that can provide terrain avoidance protection, was only to be available in flight and thus only useful after the critical go/no-go decision would have been made.

The pilot's ultimate decision to take off from Zakinthos was likely affected by three factors:

- **Get-home-itis:** an individual's tendency to want to "get home" or achieve the planned target, expressed as a function of the distance from "home" or the target. The shorter the distance, the stronger the tendency to complete a plan. This natural tendency very often characterizes pilots' decision-making process, e.g., when deciding to attempt to land at an airport or take off from an airport despite weather reports that suggest it is unsafe to do so, when deciding to persist in marginal VMC that eventually leads them to IMC.

  Decision making, in general, is largely based on the way the pilot "frames" a problem or situation, for example, when approaching an airport in poor weather conditions. If the situation is viewed in terms of potential losses (e.g., the time and fuel cost of diverting), the pilot will likely be more risk-seeking and choose to continue on to the destination. In contrast, if the decision is framed in terms of anticipated gains (safety), the pilot will likely act in a more risk-averse manner and select to divert. Research shows that as goal achievement gets closer, i.e., as the aircraft closes in on the destination airport, there is a natural shift to framing a

problem in terms of losses – and many pilots choose to land rather than divert (O'Hare & Smitheram, 1995)[3].

The accident pilot was not in flight and his decision did not have to do with approaching but rather departing from an airport. Still, he may have similarly been affected by get-home-it is. His relatively high number of flight hours (>400 flight hours on the a/c type) may have falsely exacerbated his sense that it was possible (and wise) to attempt to fly and reach his final destination. Light conditions were still good (sunset at 17:11 h) and permitted a VFR flight.

In fact, the pilot may have started displaying symptoms of get-home-it-is on a larger scale when he insisted on flying for a long time under the threat of icing – in contrast to the pilot of the other a/c with which he was flying, who chose to divert and land at the Athens International Airport.

What is certain is that the most encumbering factor must have been the fact that, if the pilot had decided to stay overnight at Zakinthos, he would not have been able to depart again until 15:30 h of the following day, because of the operational hours of the airport. Such a delay would have meant, in turn, a significant delay of the couple's arrival at their final destination where they had a specific purpose and schedule to follow. Having forced to deviate from his initial route, and having ended up in Zakinthos, the pilot, in some sense, may have felt "trapped" on the island with an only option to depart again immediately.

- **Over-confidence**: the pilot may have under-appreciated the risk of conducting a VFR flight in an unfamiliar area because of the technology aboard his aircraft. In other words, he may have overestimated his abilities, relying on the terrain avoidance features of the aircraft that would allow him to discover and avoid terrain once airborne.

  Pilots' tendency to overestimate their abilities, especially regarding issues of assessing the weather and its effects on a flight, but also the challenges of facing such weather can be shown through data derived from accidents attributed to

[3] O'Hare, D., & Smitheram, T. (1995). "Pressing on" into deteriorating conditions: An application of behavioral decision theory to pilot decision making. The International Journal of Aviation Psychology, 5, 351-370.

flights that begin under VFR but ended up in IMC. Twenty four percent of those (the database concerns 409 general aviation accidents in the USA that occurred between 1990 and 1997) involved unintended flight into IMC, implying poor assessment of weather conditions (Goh & Wiegmann, 2002)[4].

- **Fatigue**: Kerkira was the final destination and the last leg of the series of flights planned for the day. The pilot's effort to reach his destination was directly connected with the ability of the couple to rest. In addition, this overnight stay would mean that they would be on schedule, and would be arriving in Elba (ultimate destination), as planned, on the next day. Fatigue is an important factor that can strongly influence decision making, and often further increases get-home-it-is.

2.4.2 The Flight

Shortly after taking off, and while the aircraft stopped being tracked by radar because of geographical obstacles and the a/c altitude, the pilot contacted the Andravida Approach controller and asked for a weather report in the region saying "*Do you know a report weather in your area?"* The controller, after speaking to Kefalonia and becoming informed about the weather in that airport area, gave him the latest weather report for Kefalonia. This report, when compared with the METAR that was out for Kefalonia at the time the a/c took off, indicated significant changes since visibility had dropped to 5 nm, there was mist and the cloud ceiling had decreased.

It is not known if the pilot made this comparison, however he continued the flight. At the time, according to his report, he was flying in a direction of 330° and was 91 nm from Kerkira.

After the Kefalonia weather report, the Andravida controller contacted Preveza, which lies north of the route to Kerkira, to inquire about the weather in that area. The Preveza controller informed him that the weather conditions were poor and there were storms in the area between Kefalonia and Kerkira. The controller contacted the

[4] Goh, J. & Wiegmann, D. A. (2002). Human factors analysis of accidents involving visual flight rules flight into adverse weather. Aviation, Space, and Environmental Medicine, 73, 817-822.

accident a/c four times in order to relay that information, but did not receive a response. When the pilot finally responded, he stated that he was returning to Zakinthos and that he was 25 nm North of Zakinthos, so the controller never relayed to him the weather information he had received from Preveza.

In the 4 minutes and 6 seconds between the pilot's report that he was 91 nm from Kerkira and his report that he is returning to Zakinthos and was 25 nm from the island, and based on the aircraft's speed, he should have travelled about 10 nm. Had he continued on the same course towards Kerkira, he should have been 81 nm South of Kerkira and 40 nm North or Zakinthos. The fact that he reports 25 nm North of Zakinthos means that he continued on course towards Kerkira, flew past Kefalonia, encountered the inclement weather that Preveza had reported between Kefalonia and Kerkira, realized that it would not be safe to fly into the weather and decided to return.

From that moment on, there is no further information regarding the pilot's actions and the course of the a/c, since this was no tracked by radar, other than the statements of the residents of the village at the foot of the mountain who said they heard the a/c flying above them but could not see it because of clouds and fog in the area. Another indication that something was not going well were the three calls by the pilot's spouse who, in a stressed tone, said, "just a minute please" at 16:54:46 h (one minute and 16 seconds after the report that they were returning and were now 25 nm from Zakinthos), "help please" at 16:56:25 h and "just a minute please" at 16:56:45 h.

At 16:57:26 h, the sound emitted by an ELT was transmitted but ceased 2 minutes later, possibly because of the fire that followed the impact of the a/c with the ground. The impact location is 25 nm from the Zakinthos airport. In order to explain and justify how, 3 min and 56 sec after the pilot's report that he was 25 nm North of Zakinthos, the a/c found itself again at the same distance from Zakinthos, the possibility that the aircraft circled around the area must be assumed. Such an explanation would coincide with the ear-witness' statement that the *"a/c was circling around the mountain area."*

Assuming that the pilot was using the automatic pilot, when he decided to return to Zakinthos he would have selected "GO TO ZAKINTHOS." The appropriate

information would have already been stored since he had landed in Zakinthos about 2 hours earlier. As was confirmed by the simulation flight on an SR-22 type a/c equipped with the same electronics as the accident a/c, from the position where it has been calculated that the a/c was when the pilot decided to return, the autopilot executes a right turn, because Zakinthos is on a turn of fewer degrees turning to the right than if turning to the left. Assuming a normal rate of 17° that the autopilot uses for a turn, the a/c initially flies over the mountainous bulks with an altitude of 1,500 ft - 1,700 ft and then crosses the area of the village where the witnesses heard it fly over. At this position, the a/c has the main bulk of Mt. Ainos, whose elevation is 5,100 ft, to its left and at a very close distance.

Assuming, on the other hand, that the pilot was not using the autopilot, it is more likely that he would have initially turned to the left in order to fly towards Zakinthos. A left turn seems more reasonable, since he had the water on his left and the island, with its mountain on his right. Although his intention would have been to conduct a 180° turn and continue towards Zakinthos, the fact that the a/c was heard flying for some time over the village at the foot of the mountain, and that it remained 25 nm from Zakinthos, as well as that its direction upon impact was NNE, imply that the pilot did not suspend the turn in a timely fashion, and the a/c did not acquire a South course towards Zakinthos. On the contrary, it seems that it continued turning, reached the foot of the mountain, in the area of the village where it was reported to have been flying over.

From the above two mentioned assumption the most possible is the first one i.e. the autopilot was engaged causing the a/c to tune right.

Upon reaching the above mentioned region, because of the course of the a/c at the time, the TAWS must have issued a warning about the imminent danger due to proximity to terrain and the pilot probably tried to gain altitude by circling. In the effort to gain altitude and while the a/c was in a climb on a NNE course, it collided with the mountain at an altitude of 4,460 ft. It is not possible to decide who was flying the aircraft at this specific moment, given according to the flight plan the man was the pilot in command while the left seat was occupied by his spouse. Anyway, at

any case, the aircraft was equipped with twin controls and the pilot in command could fly the aircraft from the right seat.

It therefore becomes obvious that at some point in time, while flying in IMC, and despite the equipment available on board the a/c and which in theory provided position information, the pilot lost awareness of the aircraft's position in space. His relatively small experience in IFR flight likely did not allow him to perceive, in a timely fashion, and combine all the information that the instrument indications in the cockpit were providing to him, leading to a loss of situational awareness. Given that the wife/spouse had less flying experience, the crucial decision about handling the situation they were facing, must have been made by the husband.

In examining, after the fact, the pilot's general judgment, risk assessment, decision making, and actions, it is important to emphasize the important factor played by technology on board an a/c. Studies show that general aviation pilots' decision to remain airborne in marginal VMC or continue their VFR flight into IMC when they have GPS on board their a/c is far more likely than when they don't have a GPS.[5] The same pilots reported lower estimates of the threat posed by the risks involved. Another study suggests a direct link between the time spent looking at displays and the sophistication of technology (e.g., resolution of the radar display). Pilots with advanced technology delay their decision to divert and come close to thunderstorm cells because they become distracted by the displays. In comparison, pilots without advanced weather and other navigation displays at their disposal tend to be more conservative in their decisions and display more proactive behaviour that often involves avoiding potentially hazardous situations. In other words, pilots with advanced displays tend to display more "reactive" behaviour, using the available technology to improvise on the spot, effectively pushing a situation to its limits. This shift in decision making from proactive to reactive (or strategic to tactical) has featured in a number of incidents and accidents. For example, 76% of general aviation

[5] Johnson, N.R., Wiegmann, D.A., Goh, J. and Wickens, C.D. (2005). Cockpit technology and weather-related decision making: An integrative review. Presented at the 13th International Symposium on Aviation Psychology, Dayton, OH.

accidents involve intentional flight into adverse weather, indicating a mistake in risk perception. (Goh & Wiegmann, 2001)[6].

In general, there is general concern in the aviation industry that the technology available in Technically Advanced Aircraft, such as the accident a/c, may increase workload and decision making hazards. Even the best technology and tools are only as good as the ability of their user to make good use of them. Sophisticated computers and displays on board aircraft require proper training before a pilot is able to take full advantage of their features, and to be able to access, in a timely manner, the information being sought without, as the expression goes, "getting lost in the box." A pilot's familiarity with advanced automation on board his or her aircraft and experience with using it effectively in benign conditions greatly affects his or her ability to take full advantage of that automation when the situation becomes complicated – without losing precious time, situation awareness and, ultimately, control of the aircraft.

It is important to remember that at the time the 62 year old pilot decided to turn around and return towards Zakinthos, he had been awake for 14 h, most of which in the air, some of which in demanding conditions.

2.4.3 The Weather

From the METAR and TAF reports issued for the airports of Kerkira and Kefalonia and the SPESI that was issued for Kefalonia at 16:12 h, twelve minutes after the METAR report of 16:00, that mentioned the presence of mist, it follows that more attention should have been paid to the weather prior to the execution of the flight.

In general, the prevalence of southerly winds in the region, at all basic levels (500 - 850 - SFC) is cyclonic for the month of April, when the water temperature is relatively low, leads to an increase in the presence of mainly stratiform clouds of limited instability.

[6] Goh, J. & Wiegmann, D. (2001). Visual flight rules (VFR) flight into instrument meteorological conditions (IMC). Presented at the 11th International Symposium on Aviation Psychology, Columbus, OH

The low stratiform clouds are depicted in satellite pictures (Appendix B) and in the METAR remarks of the surrounding airports and especially the reports of the Kefalonia airport (FEW015-SCT018-BKN025-BKN080). At the same time, the small difference in temperature with a Dew Point (17/14) reinforces the possibility of larger volumes of clouds with even lower bases (below 1,000 ft) downwind, and restricted visibility (5,000 m) because of the high relative humidity (>80%).

All the above, in combination with the medium strength South wind stream that appears in the METAR remarks of the surrounding airports and especially that of Kefalonia (19012KT) which strengthens as it gets higher, reveal that at the time of the accident there were clouds of increasingly lower bases, very likely below 1,000 ft because of the mountainous terrain and concurrently restricted visibility outside the clouds.

3 Conclusions

3.1 Findings

3.1.1 The pilot had a valid license and medical certificate, but his experience in IFR flights was restricted.

3.1.2 The other occupant of the a/c, the pilot's wife, had a valid pilot's license and medical certificate.

3.1.3 According to its maintenance records, the a/c was airworthy and had all equipment required for IFR flight.

3.1.4 The flight KOS-KERKIRA that was eventually flown as KOS-ZAKINTHOS was largely conducted under the threat of icing and under the Minimum Safety Altitude (MSA), factors that increased the pilot's workload and stress level.

3.1.5 The Air Traffic Controller's action to allow the flight to descend under the MSA was not prescribed.

3.1.6 Shortly after landing at Zakinthos, the pilot decided to fly again to Kerkira. An important factor in this decision must have been the fact that the Zakinthos airport would be opening the next day at 15:30 h, implying a

significant delay in the arrival time of the couple at their final destination where they had a specific purpose and schedule to follow.

3.1.7 Before his departure, the pilot communicated via telephone with the weather station at the Kerkira airport and received the weather report for the prevailing conditions (METAR of 15:50 h).

3.1.8 According to the published METAR for the Kerkira airport, the thunderstorm clouds that were reported in the METAR of 15:50 h were expected to evolve into a thunderstorm in the METAR of 16:20 h.

3.1.9 After taking off from Zakinthos, the pilot came into contact with Andravida and asked for a weather report in that area.

3.1.10 The report given to him by Andravida for the Kefalonia region, through which the a/c would be flying on the way to Kerkira, showed that weather conditions were worsening.

3.1.11 The a/c continued on its course to Kerkira, but during the time that Andravida was in contact with Preveza, further N on the route to Kerkira, to receive information about the prevailing weather, the pilot encountered inclement weather N of Kefalonia and decided to return to Zakinthos.

3.1.12 At the time of his return, increased clouds with low bases, very likely below 1,000 ft because of the mountainous terrain, and reduced visibility outside the clouds, existed in the Kefalonia area.

3.1.13 Entering the region with the above-mentioned weather conditions, the pilot, despite the advanced technological equipment on board the a/c, lost awareness of the a/c position in space and followed the wrong course, which eventually resulted in the aircraft's impact with the mountain.

3.1.14 From the findings, it is concluded that at the time of impact the a/c was in a climb.

3.2 Probable Causes

- Failure in risk assessment and decision making regarding the execution of a VFR flight from Zakinthos to Kerkira,
- Untimely interruption of the VFR flight, resulting in inadvertent flight into IMC,
- Loss of situational awareness, resulting in the impact of the a/c with the mountain (CFIT – Controlled Flight Into Terrain).

Helliniko, 19 January 2011

The Chairman	**The Members**
Akrivos Tsolakis	S. Giannakoulis
	S. Dionysatos
	D. Michalopoulos

Exact Copy
The Secretary

J. Papadopoulos

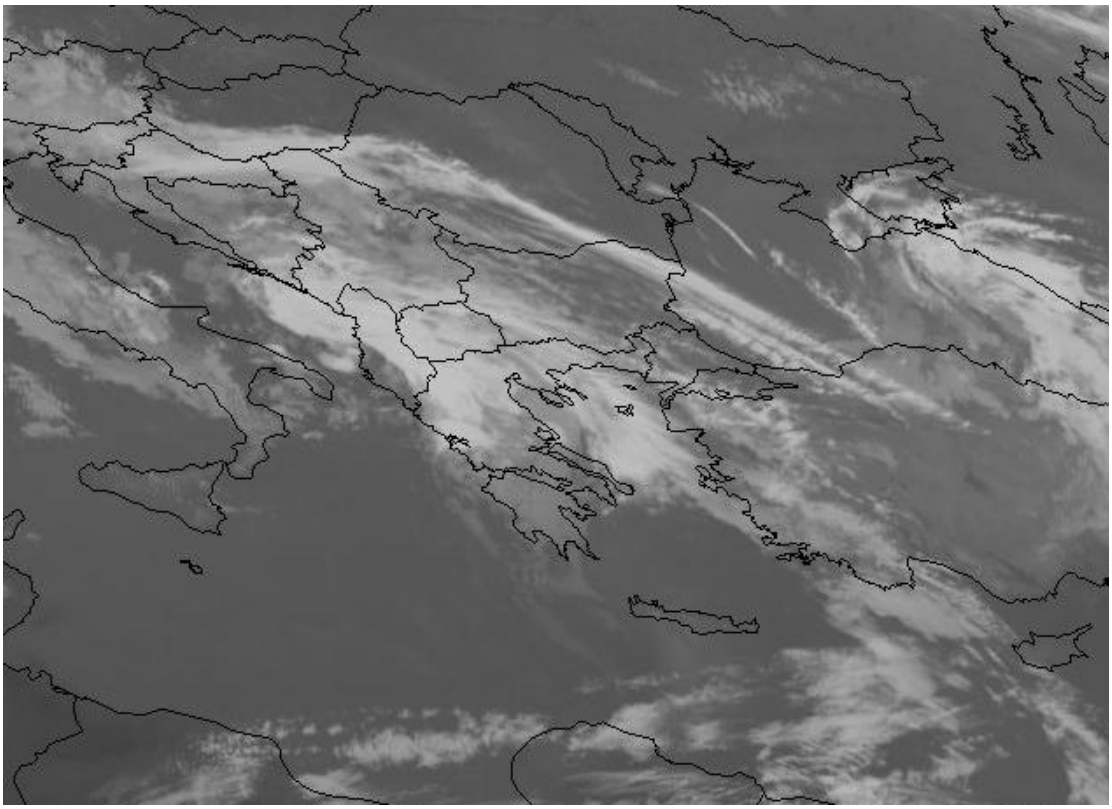
APPENDIXES

- Appendix A : Course of the A/C in ATHINAI FIR
- Appendix B : Satellite Meteo Photo

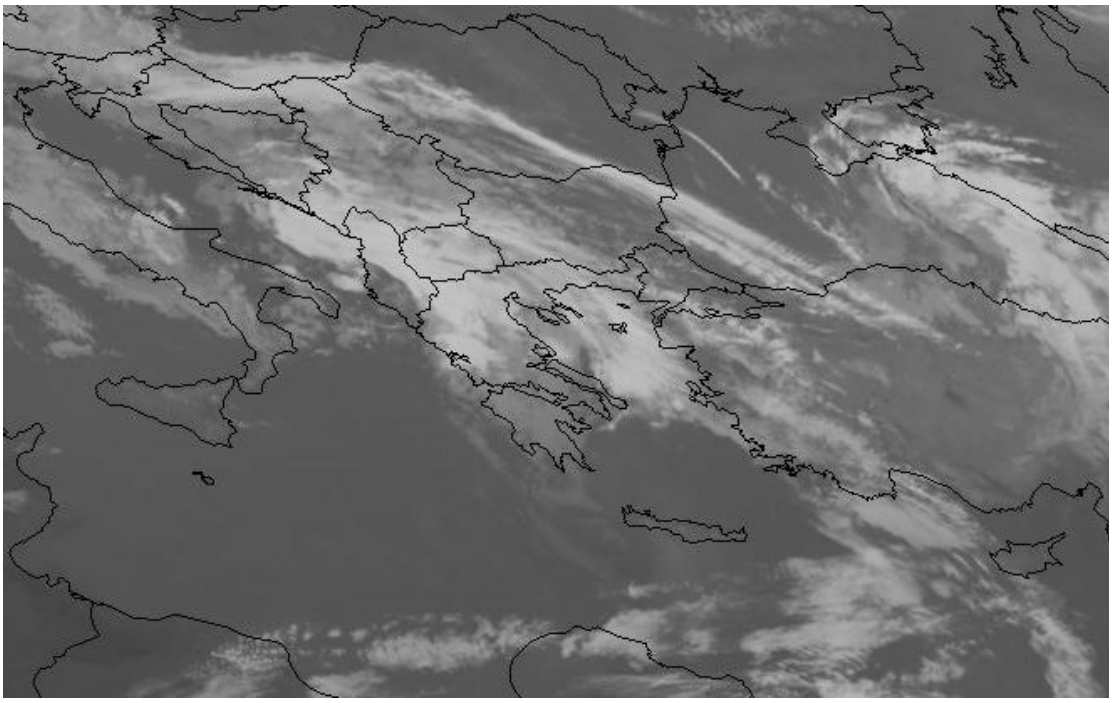
APPEDIX A

Destination
Airport LGKR
ATS Route
H51
Ελλάδα
Impact point
Mt. Ainos
Probable point
return to
LGZA
Airport LGAV
ARA/VOR
Airport LGKF
NEMES
Airport LGZA
ATS Route
B34
Αεροδρόμιο
LGKO
DIDIMON/VOR
A/C Route LGKO - LGZA
ATS Route Kos-Gilos-B34-
ARA/VOR-H51-Kesal-Kerkyra
A/C Route LGZA – Mt. Ainos
GILOS
MILOS

APPEDIX B



MSG IR Ch9, 28.04.09, 16:45 UTC



MSG IR Ch9, 28.04.09, 17:00 UTC