

AA2017-6

**AIRCRAFT ACCIDENT
INVESTIGATION REPORT**

**PRIVATELY OWNED
J A 5 0 K M**

September 28, 2017

The objective of the investigation conducted by the Japan Transport Safety Board in accordance with the Act for Establishment of the Japan Transport Safety Board and with Annex 13 to the Convention on International Civil Aviation is to determine the causes of an accident and damage incidental to such an accident, thereby preventing future accidents and reducing damage. It is not the purpose of the investigation to apportion blame or liability.

Kazuhiro Nakahashi

Chairman

Japan Transport Safety Board

Note:

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

AIRCRAFT ACCIDENT INVESTIGATION REPORT

CRASH

PRIVATELY OWNED PZL-BIELSKO SZD-50-3 PUCHACZ

(GLIDER, TWO-SEATER), JA50KM

SAKAE-TOWN, INBA-GUN, CHIBA PREFECTURE

AT ABOUT 12:20 JST, MARCH 17, 2016

August 28, 2017

Adopted by the Japan Transport Safety Board

Chairman Kazuhiro Nakahashi

Member Toru Miyashita

Member Toshiyuki Ishikawa

Member Yuichi Marui

Member Keiji Tanaka

Member Miwa Nakanishi

1. PROCESS AND PROGRESS OF THE INVESTIGATION

1.1 Summary of the Accident	On Thursday, March 17, 2016, a privately owned PZL-Bielsko SZD-50-3 Puchacz, registered JA50KM, launched from the Otone airfield for a flight training by aero-tow. It crashed on two houses in a residential area in Sakae-town, Inba-gun, Chiba prefecture and was destroyed and both of an instructor and a trainee on board died.
1.2 Outline of the Accident Investigation	Japan Transport Safety Board designated an investigator-in-charge and an investigator to investigate this accident on March 17, 2016. An accredited representative of the Republic of Poland, as the State of Design and Manufacture of the aircraft involved in this accident, participated in the investigation. Comments were not invited from the parties relevant to the cause of the accident, because the persons on board died in this accident. Comments on the draft Final Report were invited from the relevant State.

2. FACTUAL INFORMATION

2.1 History of the Flight	According to the statements of witnesses and people concerned with the flying club where the persons on board were member, the history of flight was summarized below: At about 12:05 Japan Standard Time (JST, UTC+9hrs, unless otherwise stated all time are indicated in JST based on a 24-hour clock) on March 17, 2016, the privately owned PZL-Bielsko SZD-50-3 Puchacz, registered JA50KM (hereinafter referred to as the Glider), launched by aero-tow for a flight training to obtain a private pilot certificate for glider from runway 07 of the Otone airfield (hereinafter referred to as the
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Airfield) in Kawachi Town, Inashiki-gun, Ibaraki prefecture, with the trainee on the front seat and the instructor (captain) on the rear seat. The accident flight was the second one of the day for the instructor and the trainee, and the first flight of the day was the first one by the type of glider for the trainee. The instructor had flown with another member of the flying club in-between these two flights.

The Glider left from the tow plane at the western sky of the Airfield at an altitude of about 3,000 ft.

The pilot who took off from the Airfield following the Glider at 12:06, watched it flying at an altitude of about 1,500 ft between Wakakusa-Ohashi bridge and the Airfield during his flying toward the right base leg of the runway 07 in order to land at the Airfield. After that, the pilot saw that the Glider was flying toward Ajikidai at the south of the Airfield, when his aircraft was almost at the final leg of the runway 07.

According to a member of the flying club (hereinafter referred to as the Club), the sky around the accident site was one of flight routes to enter the south side of a traffic pattern of the Airfield. The sky of the residential area tends to generate thermals, the member sometimes use it to glide.

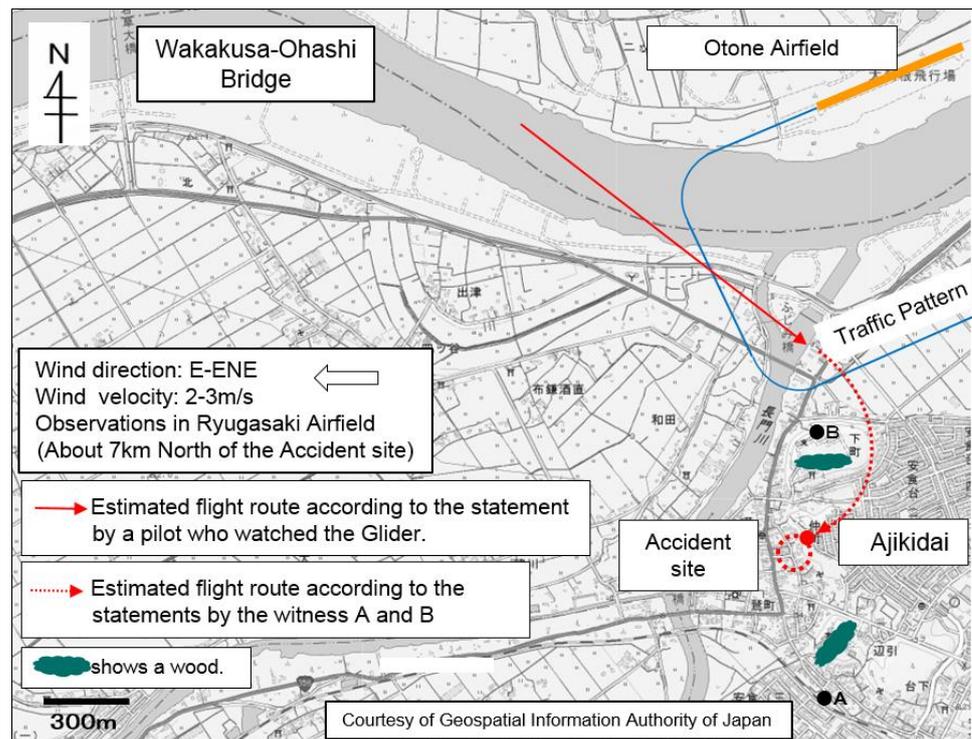


Figure 1. Estimated Flight Route

A witness A who was at about 600 m south of the accident site saw that the Glider was flying in a posture that the nose was so low while rotating on its fuselage, but he could not see the following scene, because a wood hid the Glider from his eyes.

A witness B who was at about 400 m north of the accident site saw that the Glider was diving while showing its wings surface, but she did not remember whether it was rotating or not. She could not see the final scene

	<p>because a wood hid the Glider from her eyes.</p> <p>The accident occurred at around 12:20 on March 17, 2016, in Sakae Town, Inba-gun, Chiba prefecture (35°50'35"N, 140°14'17"E).</p>																																
2.2 Injuries to Persons	<p>(1) The instructor and the trainee died.</p> <p>(2) No resident was injured.</p>																																
2.3 Damage to Aircraft	<p>Extent of Damage: Destroyed</p> <ul style="list-style-type: none"> • Aft Fuselage: Rupture • Forward Fuselage: A part below the front seat of the cockpit was seriously damaged and the front seat fell out. • Both wings: Rupture <p>Extent of Damage to the residential properties</p> <ul style="list-style-type: none"> • The roofs and others of two houses were damaged. 																																
2.4 Personnel Information	<p>(1) Instructor Male, Age 69</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding-left: 20px;">Commercial pilot certificate (glider)</td> <td style="text-align: right;">August 15, 2014</td> </tr> <tr> <td style="padding-left: 20px;">Type rating for high class glider</td> <td style="text-align: right;">August 15, 2014</td> </tr> <tr> <td style="padding-left: 20px;">Flight instructor certificate (glider)</td> <td style="text-align: right;">August 15, 2014</td> </tr> <tr> <td style="padding-left: 20px;">Class 1 aviation medical certificate</td> <td style="text-align: right;">Validity: May 26, 2016</td> </tr> <tr> <td colspan="2" style="padding-left: 20px;">Pilot Competency Assessment</td> </tr> <tr> <td style="padding-left: 40px;">Expiration date of piloting capable period</td> <td style="text-align: right;">March 9, 2018</td> </tr> <tr> <td style="padding-left: 20px;">Total flight time</td> <td style="text-align: right;">229 hours 30 minutes (626 launches)</td> </tr> <tr> <td style="padding-left: 40px;">Flight time in the last 30 days</td> <td style="text-align: right;">1 hour 16 minutes (6 launches)</td> </tr> <tr> <td style="padding-left: 20px;">Total flight time on the type of glider</td> <td style="text-align: right;">36 hours 34 minutes (92 launches)</td> </tr> <tr> <td style="padding-left: 40px;">Flight time in the last 30 days</td> <td style="text-align: right;">0 hours 38 minutes (2 launches)</td> </tr> <tr> <td style="padding-left: 20px;">Latest flight on the type of glider</td> <td style="text-align: right;">November 27, 2014</td> </tr> </table> <p>(2) Trainee Male, Age 66</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding-left: 20px;">Private pilot certificate (Airplane)</td> <td style="text-align: right;">November 7, 1972</td> </tr> <tr> <td style="padding-left: 20px;">Class 2 aviation medical certificate</td> <td style="text-align: right;">Validity: January 7, 2017</td> </tr> <tr> <td style="padding-left: 20px;">Total flight time (glider)</td> <td style="text-align: right;">1 hour 54 minutes (4 launches)</td> </tr> <tr> <td style="padding-left: 40px;">Flight time in the last 30 days</td> <td style="text-align: right;">0 hours 23 minutes (1 launch)</td> </tr> <tr> <td style="padding-left: 20px;">Total flight time on the type of glider</td> <td style="text-align: right;">0 hours 23 minutes (1 launch)</td> </tr> </table>	Commercial pilot certificate (glider)	August 15, 2014	Type rating for high class glider	August 15, 2014	Flight instructor certificate (glider)	August 15, 2014	Class 1 aviation medical certificate	Validity: May 26, 2016	Pilot Competency Assessment		Expiration date of piloting capable period	March 9, 2018	Total flight time	229 hours 30 minutes (626 launches)	Flight time in the last 30 days	1 hour 16 minutes (6 launches)	Total flight time on the type of glider	36 hours 34 minutes (92 launches)	Flight time in the last 30 days	0 hours 38 minutes (2 launches)	Latest flight on the type of glider	November 27, 2014	Private pilot certificate (Airplane)	November 7, 1972	Class 2 aviation medical certificate	Validity: January 7, 2017	Total flight time (glider)	1 hour 54 minutes (4 launches)	Flight time in the last 30 days	0 hours 23 minutes (1 launch)	Total flight time on the type of glider	0 hours 23 minutes (1 launch)
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2.5 Glider Information	<p>Type of the Glider: PZL-Bielsko SZD-50-3 Puchacz</p> <p>Serial Number: B-1084 Date of Manufacture: June 16, 1983</p> <p>Certificate of Airworthiness: No.2016-33-01, Validity: January 5, 2017</p> <p>Category of Airworthiness: Glider Utility U</p> <p>Total flight time 2,375 hours 29 minutes</p> <p>When the accident occurred, the weight and the position of the center</p>																																

	<p>of gravity of the Glider were estimated to have been within the allowable range.</p>																													
<p>2.6 Meteorological Information</p>	<p>According to the persons involved in the Club, the weather around the Airfield was sunny and good condition.</p> <p>Wind direction and velocity corresponding to the time of the accident observed at Ryugasaki Automated Meteorological Data Acquisition System, Japan Meteorological Agency located about 4 km north-northwest of the Airfield were as follows;</p> <table border="1" data-bbox="466 510 1433 784"> <thead> <tr> <th rowspan="2">Time</th> <th colspan="2">Average</th> <th colspan="2">Maximum Wind</th> </tr> <tr> <th>Wind Direction</th> <th>Wind Velocity</th> <th>Wind Direction</th> <th>Wind Velocity</th> </tr> </thead> <tbody> <tr> <td>12:00</td> <td>ENE</td> <td>2.4 m/s</td> <td>ENE</td> <td>4.3 m/s</td> </tr> <tr> <td>12:10</td> <td>ESE</td> <td>2.2 m/s</td> <td>E</td> <td>3.9 m/s</td> </tr> <tr> <td>12:20</td> <td>E</td> <td>2.4 m/s</td> <td>E</td> <td>4.1m/s</td> </tr> <tr> <td>12:30</td> <td>E</td> <td>2.5 m/s</td> <td>ENE</td> <td>4.1 m/s</td> </tr> </tbody> </table>	Time	Average		Maximum Wind		Wind Direction	Wind Velocity	Wind Direction	Wind Velocity	12:00	ENE	2.4 m/s	ENE	4.3 m/s	12:10	ESE	2.2 m/s	E	3.9 m/s	12:20	E	2.4 m/s	E	4.1m/s	12:30	E	2.5 m/s	ENE	4.1 m/s
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<p>2.7 Permission under Civil Aeronautics Act</p>	<p>The permission for Pilot Training Flights and others were obtained, under the proviso of paragraph (1), Article 92, Civil Aeronautics Act (Act No. 231 of 1952)</p>																													
<p>2.8 Additional Information</p>	<p>(1) Information on the accident site</p> <p>The accident site is in a residential area of Sakae-town, Inba-gun, Chiba Prefecture, and is located at south of the Airfield on the opposite bank across the Tone River.</p> <p>Because an air space is restricted by Narita Positive Control Area*¹ located at the east side of the Airfield, the piloting training for glider is mostly carried out on the west and southwest of it and the sky over the residential area is one of flight routes to enter the south side traffic pattern of the Airfield from the west and southwest.</p> <p>The accident site straddled two houses lined from north to south, and the fuselage, left wing, horizontal stabilizer and vertical stabilizer of the Glider were found on the north roof of the first floor of the southern house, and the northwest roof of its second floor and the roof which is spanned from north to northwest on its first floor were partially damaged.</p> <div data-bbox="1018 985 1433 1545" style="border: 1px solid black; padding: 5px;"> <p style="font-size: small;"> N ↑ 4 ↑ Power Line Utility Pole Height:10.5m Road width 5.7m ↗ : TV Antenna ● : Damaged area of houses </p> </div> <p style="text-align: center;">Figure 2. Accident Site</p>																													

*1 “Positive Control Area” means an airspace designated in the Paragraph 1 of Article 94-2 of the CAA by the Notification by the MLIT. No person may operate an aircraft in VFR within the airspace unless otherwise authorized by ATC.

The right wing was found at scattering from the site of the southern house to the south of the site of the northern house. A part of the south side roof and the veranda on the second floor of the northern house were damaged (See Photo 1). The broken pieces of the Glider remained on those two houses and a narrow area between them.

(2) Damage on the Glider

The left main wing of the Glider was broken at about 5.8 m from the wingtip, and the right main wing was bent upward near the outside of the airbrake*2. In addition, both airbrakes were extended.

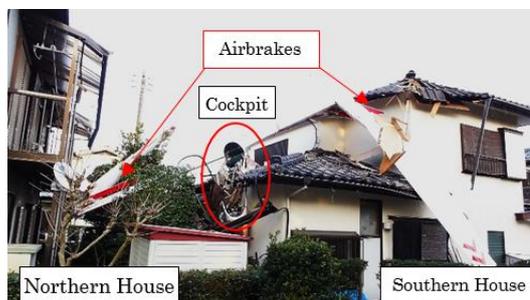


Photo1. Accident Site (View from the west)

About the cockpit, the lower part of the front seat was seriously damaged and the canopy was opened and damaged. Besides, the instruments for the rear seat, which were integrated with the canopy, were separated from the canopy and were found at south of the site at the northern house.

The trainee who was sitting in the front seat was found in the south side property of the northern house. The instructor who was sitting in the rear seat was found there wearing the safety belts and a part of the buckles was broken.



Photo 2. Aft fuselage

Parts of the aft fuselage including the horizontal and vertical stabilizer were broken at a point about 6.7m from the nose, and found on the northeast roof of the first floor of the southern house.

In addition, the recovered airspeed indicator for the front seat was indicating zero, the recovered altimeter for the front seat was indicating a close altitude to the elevation of the accident site. Indications of the rear seat airspeed indicator and altimeter were different from the ones at the front seat, however, as a result of the teardown investigation, the indication on the rear seat airspeed indicator was the position to indicate zero, and the inside of the rear seat altimeter was damaged by the shock to forward.

(3) Information on Emergency Call

According to the Chiba Prefectural Police Headquarters, an emergency call was made by a neighboring resident at 12:23.

(4) Medical Information

According to the Chiba Prefectural Police Headquarters, the death of the persons on board were caused by the impact at the time of crash.

*2 "Airbrake" is to adjust the speed or angle of descending an aircraft by extending the board to cause a resistance to air on wings.

(5) Information on Maintenance of the Glider

The Glider was submerged when parking at the Airfield because of the rising water from the Tone River by heavy rain in September, 2015. Therefore, the Glider was repaired in accordance with the repair manual issued by the manufacturer (Repair manual of SZD-50-3 PUCHACZ glass-fiber glider) and others from October of the same year to January, 2016, and passed an inspection for certificate of airworthiness in January, 2016.

The pilot who saw the Glider during his flight had witnessed the instructor performing a pre-flight inspection. In addition, even if the two flights carried out before the accident, no abnormality of the Glider was reported to the mechanics and others, and there was no radio call to notify any abnormality from the Glider during the flight.

(6) Records of Flight

There were no data of the flight recorded by GPS equipment and others.

(7) Performance and Emergency Procedure on the Glider

The Aircraft Flight Manual of the Glider has the following descriptions.(Excerpt)

① *Minimum Sink Rate/Airspeed : Airspeed 74 km/h 138 ft/min*

② *Depending on the total weight of the glider, the stalling speed in the straight flight is of about 57 km/h for a solo lightweight pilot, and about 64 km/h for two pilots with the weight close to the maximum take-off weight.*

③ *Recovery from Spin*

(1) *Use full rudder deflection opposite to the rotation.*

(2) *Wait for about 1 second.*

(3) *Push the stick forward a little beyond its neutral position.*

(4) *Return the rudder to neutral and gently pull the stick after rotation ceases.*

Use of the aileron in the direction of rotation is not preferable because it has the effect of further increasing the rotation. Keep aileron neutral.

(8) Stall Speed during Turn

In the case where the stall speed during level flight is V_s and the stall speed during turn is V , V varies corresponding to the bank angle as follows.

$$V = V_s \sqrt{n} \quad (n : \text{Load Factor during Turn.})$$

$$n = 1 / \cos\theta \quad (\theta : \text{Bank Angle})$$

(9) Information on Spin

In the "Glider Flying Handbook" issued by FAA*³, there is the following description about spin. (Excerpt)

*³ "FAA" is an abbreviation of Federal Aviation Administration.

The cause of a spin is stalled airflow over one wing before airflow stalling over the other wing. This is a result of uncoordinated flight with unequal airflows over the wings.

Spins occur in uncoordinated slow flight and high rate turns (overbanking for airspeed). The lack of coordination is normally caused by too much or not enough rudder control for the amount of aileron being used. (Omission)

Glider pilots should always be aware of the type of wing forms on their aircraft and the stall characteristics of that wing in various maneuvers.

(10) Flight inside Thermal

In the "Glider Flying Handbook" issued by FAA, there is the following description about the flight inside a thermal. (Excerpt)

Inside a Thermal

Bank Angle

Optimum climb is achieved when proper bank angle and speed are used after entering a thermal. The shallowest possible bank angle at minimum sink speed is ideal. Thermal size and associated turbulence usually do not allow this. (Omission) Thermals tend to be smaller at lower levels and expand in size as they rise higher. Therefore, a steeper bank angle is required at lower altitudes, and shallower bank angles can often be used while climbing higher.

Speed

If turbulence is light and the thermal is well formed, use the minimum sink speed for the given bank angle. This should optimize the climb because the glider's sink rate is at its lowest, and the turn radius is smaller.(Omission)

There are two other reasons to avoid thermaling speeds that are too slow: the risk of a stall and lack of controllability. (Omission)

Depending on the stall characteristics of the particular glider or in turbulent thermals, a spin entry is always possible. Glider pilots should carefully monitor speed and nose attitude at lower altitudes.

(11) Trial of Flight Characteristics of the Same Type of Glider in the UK

In the accident report (AAIB bulletin No: 1/2005) issued by AAIB^{*4}, as a result of the flight trial conducted by BGA^{*5} on the same type of glider, there are statements about the points to be paid attention to the stall characteristics during a turn and the height loss at the time of recovery from a spin.

*4 "AAIB" is an abbreviation of Air Accident investigation Branch which means the aviation accident investigating agent in UK.

*5 "BGA" is abbreviation of British Gliding Association which is the governing body for gliding in the UK.

3. ANALYSIS

3.1 Involvement of Weather	None
3.2 Involvement of Pilot	Unknown
3.3 Involvement of Equipment	Unknown
3.4 Analysis of Findings	<p>(1) Identify the Pilot Flying It was not possible to determine who piloted the flight at the time of accident because the both persons on board died.</p> <p>(2) Qualification of Persons on Board Both persons on board had valid aviation medical certificates and the instructor had a valid airman competence certificate.</p> <p>(3) Situation of the Glider The Glider had a valid certificate of airworthiness. Furthermore, no abnormality was reported to the mechanics and others at the pre-flight inspection on the day and during the previous two flights prior to the accident, therefore it is probable that the Glider had no abnormality. However, because of the deaths of the two persons on board and the severe damages to the Glider, it is not possible to determine the presence or the absence of its abnormality right before the crash.</p> <p>(4) Situation on Airbrakes Both airbrakes of the Glider were extended, however, it is not possible to determine when they were extended since the system to control them had received severe damages at the crash.</p> <p>(5) Thermal It is somewhat likely that a thermal was existing locally at the time of the accident because the temperature is apt to rise due to solar radiation since the area around the accident site is a densely populated residential area.</p> <p>(6) Situation on the Flight It is probable that the Glider was flying in the direction of the accident site from west of the Airfield at an altitude of about 1,500 ft, however, it is not possible to determine the detailed situation on the flight of the Glider at the time of the accident.</p> <p>(7) Situation on the Glider at the Time of the Crash There was no crash damaged trace at the southern house other than the northwest part of the second floor where received the crash of the left wing of the Glider and the northwest part of the first floor where received the crash of the nose, no damages on the antenna mounted on the east roof on the second floor of the house and no damages onto the utility pole and power line installed near the east boundary of those properties of two houses, therefore it is probable that the Glider was banked to left and crashed with the posture that the nose was so low.</p>

(8) Spin

It is probable that the Glider crashed because it had entered a spin and could not recover from the spin, since it was flying while rotating with the posture that the nose was so low.

Regarding why the Glider entered a spin, it is probable there are following possibilities, however, it is not possible to determine the cause, because the persons on board died;

① Stalled and entered a spin during a turn in a thermal;

As described in 2.8(10), since the range of thermal tends to be small at low altitude, a glider should stay within the range where the glider could efficiently utilize the thermal and in order to minimize a sink rate, it is effective for a pilot to fly at Minimum Sink Airspeed with consideration of a load due to a bank angle as well as a stall speed. The Minimum Sink Airspeed and the stall speed with two pilots with the weight close to the maximum takeoff weight at the time of straight flight of the Glider were respectively 74 km/h and 64 km/h. When the 45 degree bank angle is required, the Minimum Sink Airspeed and the stall speed were respectively 88 km/h and 76 km/h. It is probable that the Minimum Sink Airspeed during a turn was not sufficient margin against the stall speed for a pilot who is required to keep the speed and bank angle, at same time to deal with the change of wind and air current turbulence and to monitor the outside and others.

During a turn at low altitude where there was not enough height margin to recover from a spin or stall, it is probable that a pilot is required to pay attention to a relationship between bank angle and airspeed.

② The Glider was entered a spin accidentally during turn to manage the altitude in order to land at the Airfield.

(9) Recovery from Spin

Regarding why the Glider could not recover from a spin, it is somewhat likely that there are following possibilities, however, it is not possible to determine the cause, because the persons on board died.

a) The recovery operation was not appropriate since it was the second training flight for the trainee and the instructor had not flown the Glider for more than one year.

b) The recovery operation was executed, but the height loss was too large against the flight altitude.

4. PROBABLE CAUSES

In this accident, it is probable that the Glider was crashed because it had entered a spin and could not recover from it.

Regarding why the Glider entered the spin and could not recover from it, it is not possible to determine the cause because the persons on board died.

5. SAFETY ACTION

The Club took the following actions after the accident;

- (1) The Club implemented the safety seminar and confirmation of the competency to the members (including the contents regarding the piloting training), and at the same time, the lecture regarding how to use the Airfield to the concerned parties using it other than the members.
- (2) The Club prohibited gliders from flying over the densely populated residential area, in addition to powered aircraft (small airplane and motor glider).