1/3rd Scale Mita Type 3 Production Notes

The sixth part of a multi-part series.

Norimichi Kawakami

You may want to read the fifth part of this series before proceeding to this article. Also if you prefer, you can read this article in its original Japanese.

Fabrication Part 19: Completion of the Vertical Tail

The wooden construction of the vertical tail was finished in June 2018. Afterwards, a closer look at the photos of the actual aircraft revealed that the shape of the lower part of the vertical fin was slightly different from the one I had fabricated, so I made some corrections and then completed the work by covering, painting, and marking.

Covering, Painting and Marking

I covered the vertical tail with Oratex and painted with matte white acrylic paint. The upper part of the rudder was dyed red. The JA number is JA2103, which is the same as the former Tokai University's JA2103, so I made a sticker of 03, the last two digits of JA2103, and put it on the tail. In this way, the vertical tail was completed.


03

Photo 111: The completed vertical tail.

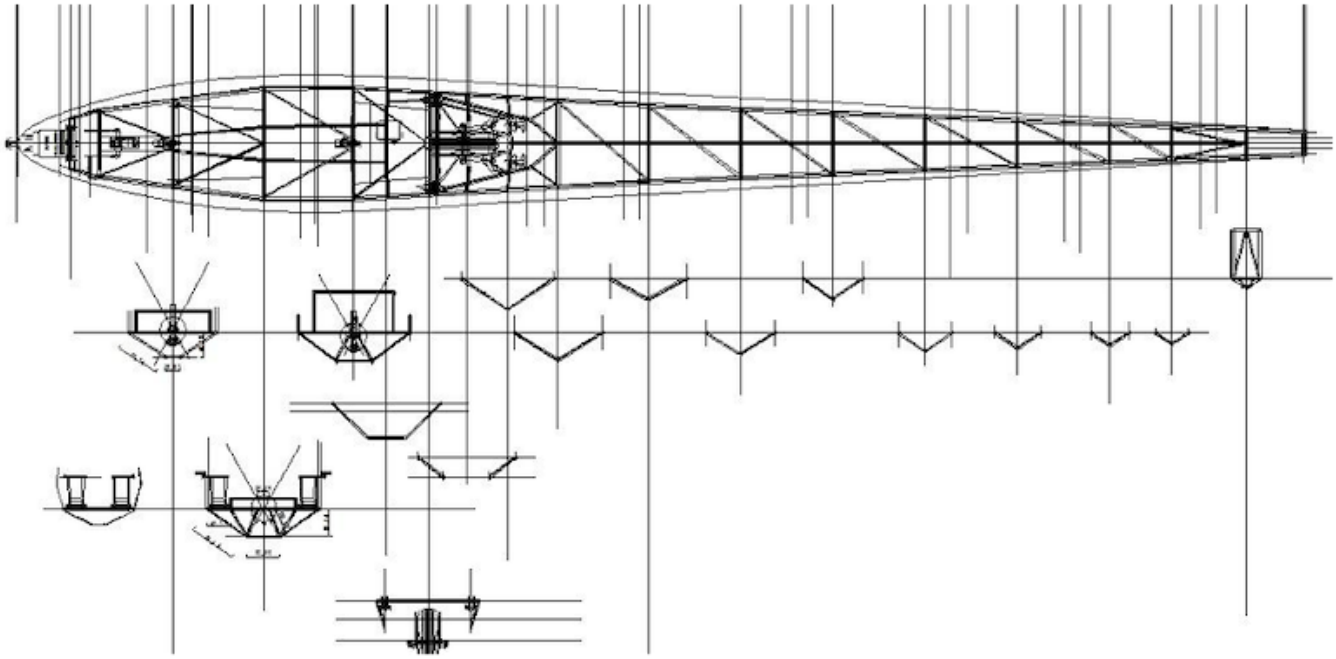
It looks like a real aircraft. The weight of the completed tail was 222g including two bolts to attach it to the fuselage. This is 10g more than expected weight.

You can see the difference in the shape of the fin when you compare it with the Photo 21. In the actual model, the rear part of the plastic fairing which straddles the intersection with the horizontal tail is inserted into the newly installed part.

Fabrication Part 20: Fuselage Lower Overhang Structure

What Is the Fuselage Lower Overhang Structure?

The fuselage of the Mita Type 3 has a rectangular cross-sectional main structure with thin steel pipes overhang above and below it. Of these, the lower overhang structure was fabricated this time. It is shown in drawing 29. The lower part of the front fuselage has a trapezoidal cross-sectional shape to cover the connecting rod between the front and rear sticks and the main wheel. In contrast, the rear fuselage overhang structure has a simple triangular cross section. Since these overhang structures are not the strength member but merely a fairing, I initially tried to make them out of 4mm diameter wooden rods, because they are light, inexpensive and there is no worry about radio interference. However, when I made some parts and installed them, I found the rigidity was not enough. This could cause the rods to be bent by the tension of the covering skin. So I changed the material to carbon pipes of the same diameter.



Drawing 29: Fuselage lower overhang structure.

Fabrication

For the carbon pipes fabrication, I followed the same procedure of the fuselage main structure. First, the trapezoidal structure of the front fuselage was fabricated on a jig as shown below.

Photo 112: Parts for the lower part of the front body structure.

At a first glance, this part looks flat, but it is bent near the center, that is why I needed a jig. It is difficult to see in the photo, but the jig is shaped like a hill, with the right side facing downhill.

Since the assembly of this part and the rear body overhang structure requires accurate centerline, I made simple assembly jigs. Photo 113 shows the assembly of the overhang structure on the assembly jigs. The fuselage is turned over so that the lower part is on top. Although it looks simple in the picture, it was quite tedious work to cut dozens of parts from the carbon pipe, match the length, and process the end faces into combination shapes.

Photo 113: Assembling the lower overhang structure.

Completion of the Lower Overhang Structure

I managed to cut out all the parts and completed the assembly.

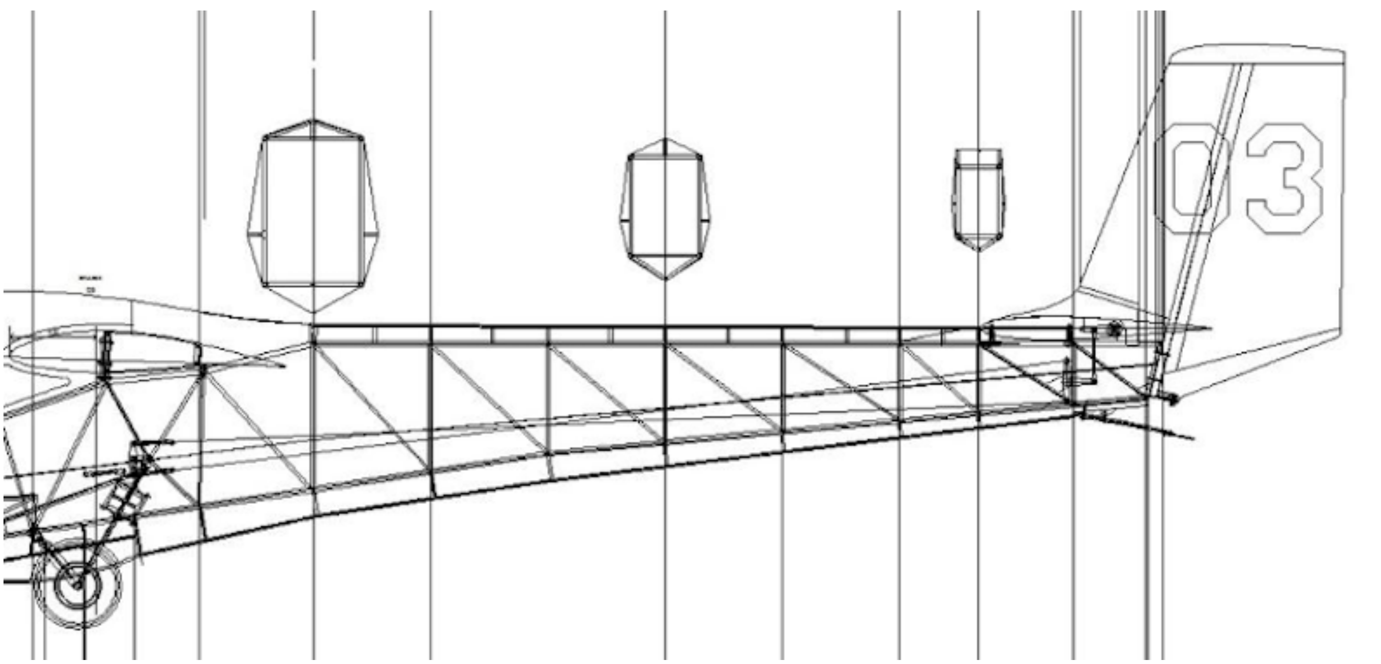
Photo 114: Completed fuselage lower overhang structure Left, front. Right, rear.

In fact, the structure around the main wheel is still not ready. The reason is that I don’t know the details of the structure of this part well enough to make a drawing. I asked the Shizuoka Aviation Museum for assistance to send me detailed photos.

Fabrication Part 21: Fuselage Upper Overhang Structure

Drawing of the Upper Fuselage Overhang Structure

Because the cockpit is in the front fuselage, the upper overhang structure is only in the rear fuselage. The structure is much simpler than the lower overhang structure.



Drawing 30: Fuselage upper overhang structure.

The upper overhang structure is only supported by simple vertical pillars while the lower one is supported by two pairs of diagonal members extending from the main body structure. The front of the structure is supported by a truss made of L-shaped aluminum channels. The rear part of the fairing, which covers the center wing, is inserted into this L-shaped channel and fixed in place.

The rear end of the structure changes its shape from triangular to rectangular so that it can be neatly connected to the horizontal tail. Therefore, the rear end is supported by a wooden rectangular frame. In order to make a continuous transition from triangular to rectangular shape, triangular wooden boards are placed on the upper two longelons of the main fuselage structure in front of the rectangular frame.

Fabricated Upper Overhang Structure

This is the completed upper overhang structure viewed from front.

Photo 115: Front part of the upper overhang structure.

The rear wooden rectangular frame and triangular boards are made of 4mm thick balsa. I also made boards between the horizontal tail fin and fuselage.

Photo 116: Rear part of the upper overhang structure.

For the beam running back and forward, I made positioning jigs just as I did for the lower structure, and built the columns while keeping the beam in the exact position. Thanks to the jigs, the beam went straight through. When the overhang structure was attached, it became even more similar to the shape of the actual machine, which increased my tension and made me look forward to the fabrication of the lateral overhang structures.

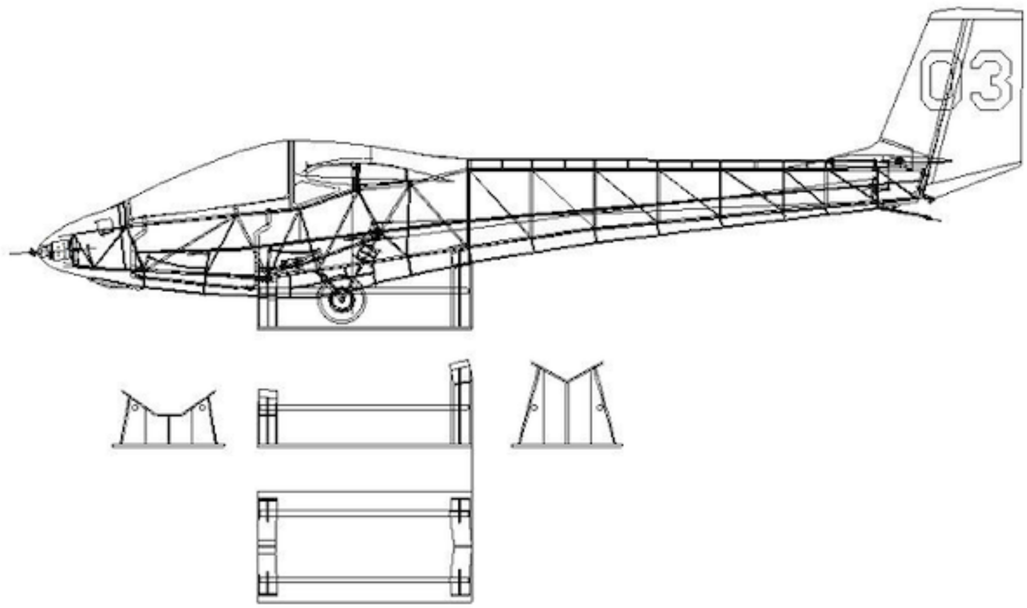
Photo 117: The completed upper overhang structure.

Fabrication Part 22: Fuselage Rack

The fuselage could not stand on its own because of the triangular-shaped lower overhang structure. So it is difficult to build the lateral overhang structures. A frame to support the fuselage was required.

Design of the Fuselage Rack

The fuselage rack was designed to support the fuselage even with the main gear attached, so that it can be used not only for work but also for storage and transportation.



Drawing 31: Fuselage rack.

This structure supports both the front and rear fuselage. The lower part of the front body is trapezoidal, and that of the back is triangular, the shape of the support structures are different. I tried to make the structure as light as possible, yet rigid enough. In addition, the rack was designed to support the fuselage horizontally. The material is mainly 4mm thick plywood, with 15mm diameter round bar handles attached to make it easier to lift.

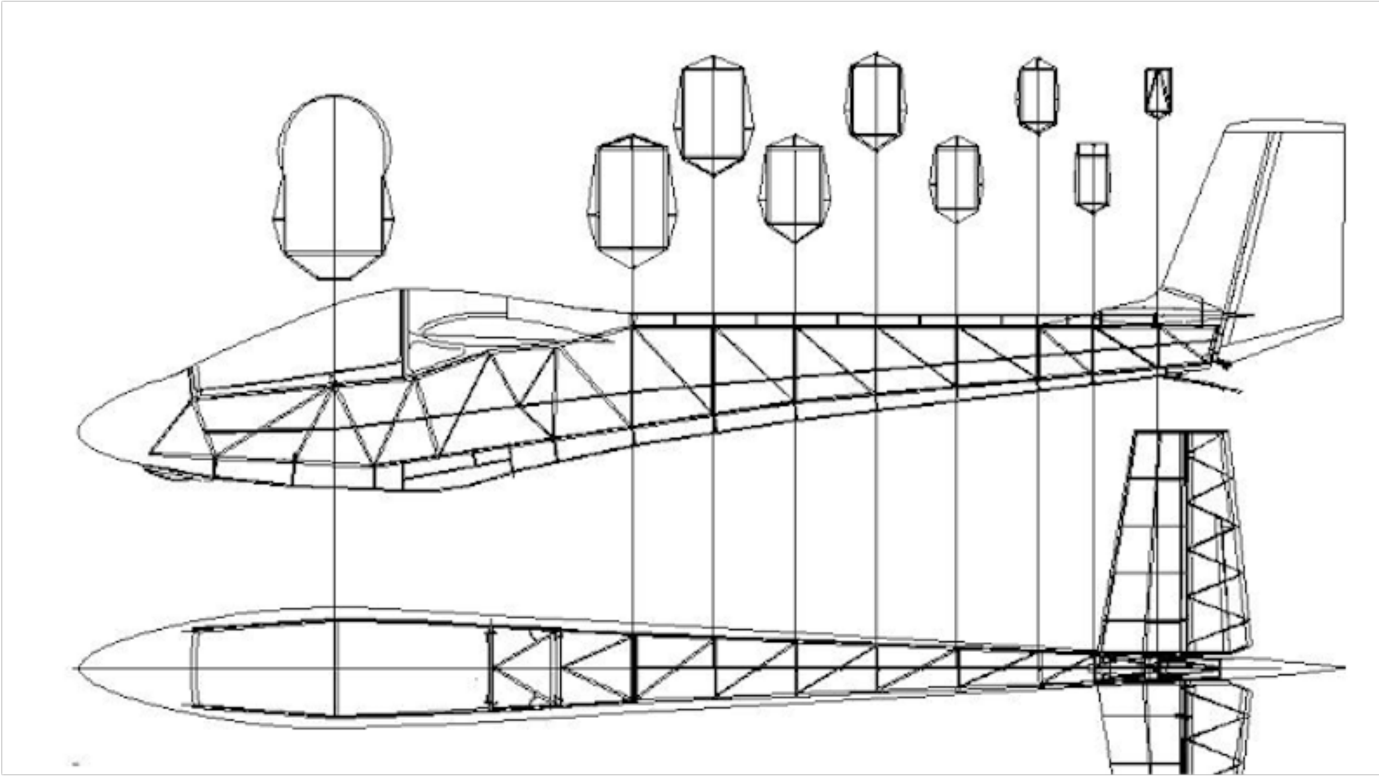
Completed Rack

The structure is simple, so it was easy to cut out parts and assemble. The fuselage is placed like this.

Photo 118: The completed fuselage rack.

Fabrication Part 23: Fuselage Side Overhang Structures

The Mita type 3 glider has thin wooden overhangs on both sides of the fuselage. The overhangs run from just after the FRP nose cowling to the tail of the fuselage. The front part of the overhang is curved and the rear part is straight when viewed from the top. The side view shows three straight lines that meet in two stations. The thickness is assumed to be about 4mm.



Drawing 32: Fuselage side overhang structures.

Fabrication of the Side Overhangs

I had a hard time deciding what material to use for this side overhang. At first, I thought of using plywood, but it is too heavy. Once I decided on balsa, however, I had to be prepared for bumping it because it is an overhang. The balsa might get dented. I was browsing through the lumber section of a Home Depot and found affordable material. It was laminated paulownia wood, 30 x 6 x 900, for about 100 yen each. It is light, moderately hard, and above all, cheap. However, it is a little too thick, so I decided to shave it down to a little over 4mm with a canner.

I made a paper pattern from the drawing, pasted it on the paulownia board, and cut it out with a cutter knife. It was a little difficult to attach the parts on the body structure. To get accurate positioning was difficult. So I made a simple positioning jig, placed the overhang structure on it, and attached it to the body truss structure using instant adhesives.

Photo 119: Installation of the side overhang using a simple positioning jig.

I thought that I would be able to complete the work in this way, but I was wrong. It was very difficult to make a straight line through the overhang structure because it is thin and long. The positioning jig only determines the position of both ends, but the center area is free. The part to be attached to the rear body is less than 10 mm wide, but nearly 900 mm long, so it is inevitably bent. When I looked through the finished product from the rear, I could see that it was curved. I had no choice but to take off the one I had made and reattach it along with a string.

Completion

It took a lot of work, but I managed to complete it.

Photo 120: Completion of fuselage side overhangs.

The 4mm thick overhang plates that were butt-jointed to the carbon pipes are a little insecure, so I used small balsa triangles to hold them in place from above and below. The large triangular pieces seen in the left side are where the access door will be installed. The access door is located on the left side of the fuselage, just below the center wing, for maintenance and inspection of the control linkages. This work was the last craft for 2018.

Reconsideration of the Power System

I was concerned about the lack of consideration for the motor, which I had previously considered and already purchased, so I re-examined it.

When I discussed the power system earlier, I set the power requirement at 130W per kg of weight. However, when I looked into this value a little more, I became a little worried. When I looked at various websites, I could not find much data in Japan, but there are many reports overseas. However, the data differs slightly from site to site.

Rules of Thumb for Power-to-Weight Ratio

One site, A, says:

- 25 watts/lb (55 watts/kg) = minimum for level flight, with a reasonably clean plane
- 50 watts/lb (110 watts/kg)= Trainer/Casual/scale flying
- 75 watts/lb (165 watts/kg)= Sport flying and sport aerobatics
- 100 watts/lb (220 watts/kg)= aggressive aerobatics and mild 3D, effortless loops from level flight
- 150 watts/lb (330 watts/kg)= all out performance
- 200 Watts/lb (440 watts/kg) = Unlimited high-speed vertical flight

Another site, B, says:

- 50–70 watts per pound (110–150 watts/kg); Minimum level of power for decent performance,park flyer/slow flyer models
- 70–90 watts per pound (150–200 watts/kg); Trainers and slow flying scale models
- 90–110 watts per pound (200–240 watts/kg); Sport aerobatic and fast flying scale models

- 110–130 watts per pound (240–290 watts/kg); Advanced aerobatic and high speed models
- 130–150 watts per pound (290–330 watts/kg); Lightly loaded 3D models and ducted fans
- 150–200+ watts per pound (330–440 watts/kg+); Unlimited performance 3D and aerobatic models

There is no direct mention of gliders, but according to Site A, 110–165 watts/kg looks good, but according to Site B, at least 150–200 watts/kg looks necessary. In other words, according to Site A, the previously set 130 watts/kg is good, but Site B says it is insufficient. I also worried about the weight because it is sure to be much higher than my original target.

Power to Weight Ratio of My Gliders

Following table shows the data of the relatively large 1/5 scale gliders that I own.

	1/5 Mita Type3	1/5 MDM-1 Fox	1/5 Minimoa	1/5 ASK-18	1/6 Grob G-109	Grob G109 actual
Weight W (Kg)	2.765	2.797	3.2	2.167	3.555	850
Wing Span b (m)	3.2	2.8	3.4	3.2	2.77	16.6
Motor	FSD FC4250-7T	OS OMA-3820-960	FSD FC4250-7T		OS OMA-3825-750	Limbach Engine
KV	710	960	710	910	750	2,400cc
weight (g)	198	160	198	110	195	90hp
LiPo number of cells	4	3	4	4	4	
Capacity (mAh)	2,600	2,650	3,300	1,800	3,300	
Propeller dia×pitch	14×8	14×8	14×8	13×6	12×8	
Current (A)	35.9	50.1	39.82	22.65	41.91	
Voltage (V)	14.43	10.77	15.15	15.41	14.64	
Power consumption (W)	518	540	603	349	614	67,000
Specific Power (W/Kg)	**187**	**193**	**189**	**161**	**173**	**79**

Table 9: Power to weight ratio data of my gliders.

The power to weight ratio (Specific Power) is generally between 160 and 190 watts per kilogram. The ASK-18, which has the lowest power-to-weight ratio, has a slightly weaker rate of climb, but the others, with the exception of the Grob G109, are able to take off like a real winch tow.

For reference, I have also included the power-to-weight ratio of the Grob

G109A, the actual motor glider. The actual motor glider is very unpowerful, less than 80 watts/kg. Naturally, the takeoff is a gentle ascent, and you can't expect the same rate of climb as with the glider's winch tow.

From this data, it is expected that 130 watts/kg will be OK for takeoff only in a calm atmosphere. The power system that I have already selected and purchased is 1300 watts class, so it will be able to cover up to 10kg of total weight. So far, the total weight is expected to be about 9 kg, which is about 140 watts/kg. However, in RC aircraft, when taking off in the wind, avoiding obstacles in front, or recovering from a sudden change in attitude due to wing tip stall during a turn, it is necessary to turn the motor to deal with the situation, and I want to have enough power margin. The question is whether 140 watts/kg has enough power margin.

Excess Power and Specific Excess Power (Ps)

The power margin is actually called the Excess Power, and in the case of aircraft, it is the difference between the maximum available power and the power required for level flight. Since the same Excess Power cannot be evaluated in the same way for a heavy aircraft and a light aircraft, it is divided by weight to determine the amount of excess power per kilogram. This is called the Specific Excess Power (Ps). Its unit is watts/kg, which is exactly the same as the power-to-weight ratio we are discussing above. The power to weight ratio minus the power required for level flight per kilogram of weight is Ps.

When the specific excess power, Ps, is zero, the plane can only fly in a straight line. However, when Ps > 0, there is a surplus of power, which allows the aircraft to accelerate, turn, and climb. The larger Ps is, the more intense the motion can be.

The unit of specific excess power Ps is watts/kg, but since 1 watt = 0.102 kg-m/sec, the unit of Ps can actually be written as m/sec. This is the same unit as the rate of climb, so Ps actually represents the rate of limb. In reality, 80 to 85% of Ps is the actual rate of climb because the aircraft is not 100% efficient in converting excess power into climb.

In other words, it is reasonable to express the power margin in Ps, and the question of how much Ps is enough for a R/C glider is the subject of interest.

Ps Prediction for 1/3 Mita

To find Ps, we need to know the power required for level flight, which can be calculated from the descent rate (sink rate) obtained from the performance prediction.

In descent flight, the rate of decrease in potential energy due to descent, i.e., descent rate x weight, provides the energy (power) required to fly at that speed in descent. If the rate of ascent equal to the rate of descent is added, a level flight is achieved, so the power required for level flight can be obtained by adding the power required for ascent to the power required for descent. Since the power required for ascent is the increase in potential energy, it can be obtained by multiplying the ascent rate by the weight. Since the rate of ascent and descent are the same, the power required for level flight can be calculated as (descent rate x weight) times two. In reality, the required power is the value obtained by correcting the power calculated above by the efficiency of the propeller and motor.

Using the above, the specific excess power Ps of the 1/3 Mita is calculated in the table below.

Speed	Km/h	32.5	35	37.5	40	45	50
Sink rate	m/sec	0.418	0.441	0.469	0.499	0.578	0.681
Potential Energy Loss Rate due to Sink	Kg· m/sec	4.18	4.41	4.69	4.99	5.78	6.81
Required Power for climb at equal rate to sink	Kg· m/sec	4.18	4.41	4.69	4.99	5.78	6.81
Necessary Power for level flight	Kg· m/sec	8.37	8.83	9.38	9.98	11.56	13.61
Same as above	W	82.0	86.5	92.0	97.8	113.3	133.4
Necessary Power for level flight per 1 Kg weight	W/Kg	8.20	8.65	9.20	9.78	11.33	13.34
Motor & Propeller efficiency		0.5	0.5	0.5	0.5	0.5	0.5
Ps at Power Weight Ratio=180W/Kg	W/Kg	81.8	81.4	80.8	80.2	78.7	76.7
Same as above	m/sec	**8.3**	**8.3**	**8.2**	**8.2**	**8.0**	**7.8**
Ps at Power Weight Ratio=140W/Kg	W/Kg	61.8	61.4	60.8	60.2	58.7	56.7
Same as above	m/sec	**6.3**	**6.3**	**6.2**	**6.1**	**6.0**	**5.8**

Table 10: Specific excess power Ps of 1/3 Mita.

The weight was assumed to be 10kg and the model propeller & motor efficiency was assumed to be 0.5. Ps is calculated for the power to weight ratio of 180 watts/kg and 140 watts/kg. Ps=8.3m/sec and Ps=6.3m/sec are expected respectively.

Required Ps

Ps of 6.3m/sec is large enough for a manned aircraft, but how does it feel for an RC glider? In order to find out, I tried to test flight with my 1/5 Mita model. The 1/5 Mita is a 4-cells model and normally flies at about 520 watts with 36A current, but I reduced the current to get 400 watts. The Ps was calculated to be about 8.6 at 520 watts and 6.4 at 400 watts, which is almost the same as the 1/3 Mita formula described above. I asked Mr. Sato, a veteran of my club, to be the test pilot.

At 520 watts (Ps=8.6m/sec), it took off and climbed like a winch tow as usual, but at 400 watts (Ps=6.4m/sec), it was much milder and climbed like an airplane tow. I also tested with a dolly, and it was possible to pull the dolly and take off even at 400 watts, so I wanted to try flying with even less power, but Mr. Sato said that this is the lower limit of power. If I set the power less than this, he feels uneasy about how to deal with any abnormalities.

In the end, we came to the conclusion that the 1/3 Mita model could be flown with a 1300 watts-class power system, but there was not enough room to deal with abnormalities. In order to avoid such a situation, I decided to change to a larger motor.

Re-Selected Power System

According to the results of the above study, a suitable motor for the 1/3 mita would be in the 1,700 to 1,800 watts class, but since I could not find a suitable motor in the same class, I decided to go with a 2,000 watts class motor, FUTABA FMA-5065 KV300.

This motor can absorb about 2,000 watts with 8 LiPo cells. Since the ESC I had was only compatible with up to 6 cells, I purchased an ESC (amplifier) for this motor that is compatible with up to 12 cells and 100A, as well as a programmer unit for the ESC. This is the set of three items that I purchased.

Photo 121: The power system I purchased again.

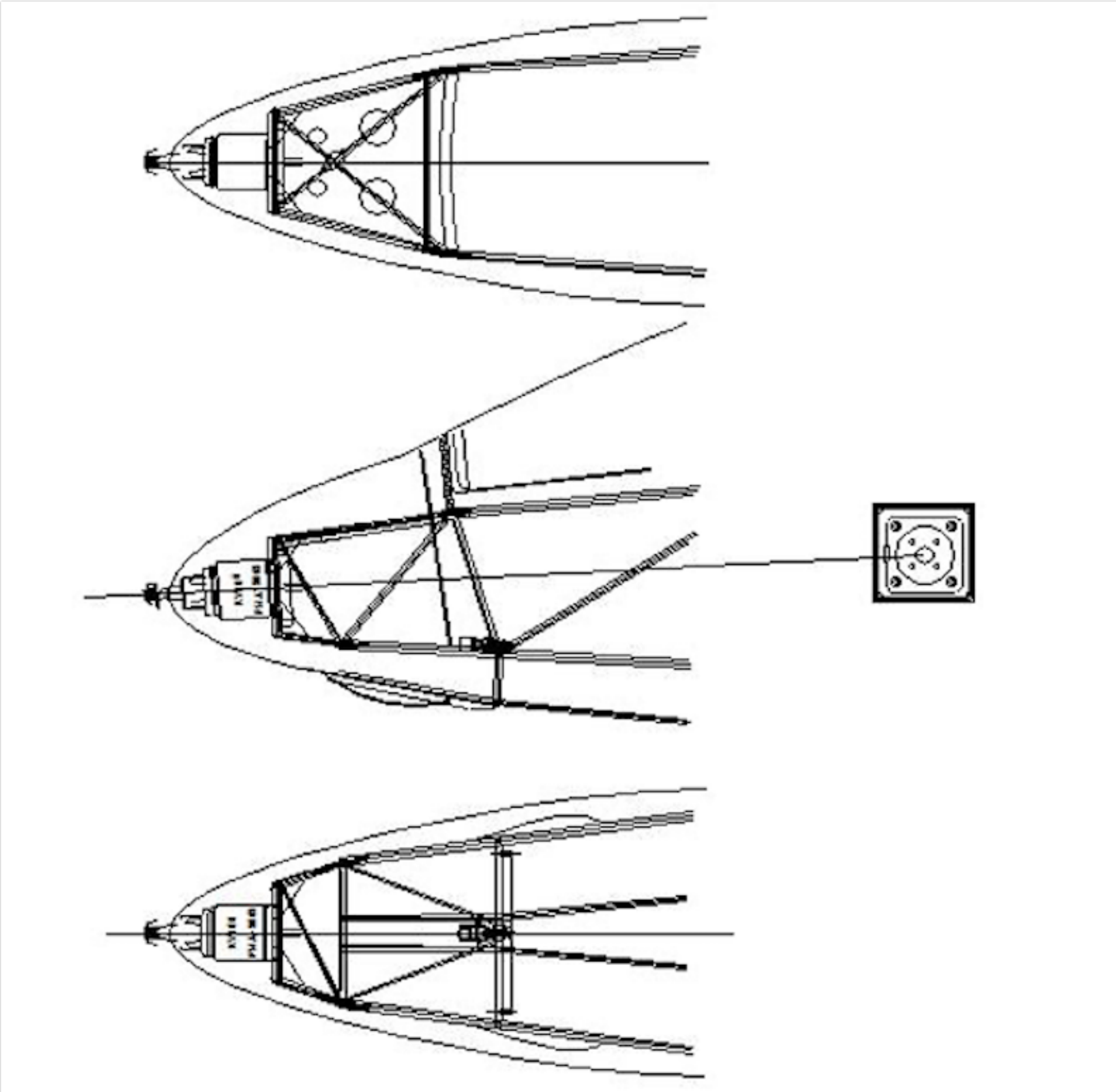
Now I no longer had to worry about lack of power. In fact, this power increase saved me from a crisis in the first flight. I'll explain it again in the first flight section.

Fabrication Part 24: Motor Mount

I immediately designed and fabricated the mount for this motor.

Design

The drawing was just a small modification of the one I had been considering before the motor reexamination.



Drawing 33: Motor mount.

The motor is back mounted. Four 5mm diameter carbon pipes are stretched out at the end of 7mm diameter longitudinal pipes of the main fuselage structure. In front of the 5mm pipes, two pieces of 4mm thick plywood are epoxied together to form a motor mounting plate. At each joint of pipes, a 50mm-long 3mm diameter steel rod is epoxied to the inside of the both pipes. A 4 mm thick plywood is placed between the upper beams. The ESC (amplifier) will be placed on top of this. Auxiliary braces are placed diagonally between the beams and the motor mounting plate. These will receive the reaction torque of the motor. In addition, eight 1 mm thick carbon triangular reinforcement plates are attached to the end of the beams and the motor mounting plate with epoxy adhesive to secure the rigidity of the truss structure.

The motor can be removed from the inside of the fuselage for maintenance and inspection. For this reason, the motor mounting plate has a hole of 52mm in diameter, which is slightly larger than the motor diameter of 50mm. Since the supplied cross mount is not long enough for the 52mm hole, a square bed made of 8.5mm thick plywood is attached to the rear of the motor, and the bed is attached to the motor mounting plate from the rear with four 3mm bolts.

The reason why the motor mounting plate and the bed are made of plywood is because the structure of the mount and the fuselage is made of carbon pipes glued together, so little structural damping can be expected. I used thick plywood plates to dampen the vibration generated by the propeller and motor.

Fabrication

Since the motor mount is attached by sticking out from the main structure of the fuselage, it cannot be attached accurately without an assembly jig. So I made a jig as shown in photo 122 and attached it to the fuselage.

Photo 122: Motor mount assembly jig.

The idea is to attach the motor mounting plate to the plate on the leading edge of the jig, and connect it to the body structure with carbon pipes. However, I encountered a big problem when I installed the jig. The jig could not be attached to the fuselage structure in a straightforward manner. If the jig was attached forcibly, the motor mounting plate would be bent at an angle. The distance between the tips of the two upper longitudinal members is slightly longer than the drawing, and the angle of the member connecting the upper and lower longitudinal members of the right side panel seems to be slightly open. The fuselage structure was assembled by using an assembly jig, so I thought the accuracy of the structure was secured, but I found an unexpected problem.

In fact, a few months ago, I accidentally stepped on this part when it was on the floor, and several parts came apart. I had to reassemble the parts that came off without putting them on the jig. I am sure that this is one of the causes, but there are some deviations that cannot be explained by this alone.

I had no choice but to disassemble the truss structure of the right side panel and reassemble it, leaving the investigation of the cause to that point. However, the truss structure was already hardened with epoxy adhesive, so it was difficult to disassemble it. The epoxy adhesive was mixed with carbon powder (photo below) which contains carbon fiber, so it was very solid.

Photo 123: Carbon powder mixed with epoxy adhesive for bonding carbon truss structure.

I managed to disassemble the truss with some difficulty, but the right side overhang structure that I had built was broken and unusable. It would have to be rebuilt. Next, I had to assemble the truss structure correctly again, but the fuselage assembly jig that I used last time could not be used now that the fuselage lower overhang structure was installed. So I decided to make a partial jig as shown below to secure the shape.

Photo 124: Simple assembly jig.

The front jig accurately holds the width of the front of the cockpit and defines the position of the motor mount. The rear jig is used to determine the exact width of the center of the cockpit. The motor mounting plate and four supporting beams are already attached to the front side jig. The right side panel of the fuselage is also temporarily assembled, but the trapezoidal members that should be located between the front and rear seats in the center of the cockpit and the right side overhang are not yet attached. The motor mounting plate has only one 4mm plate attached. One more plate will be attached with epoxy adhesive.

Completion of the Motor Mount

After all this hard work, I managed to complete the motor mount.

Photo 125: The completed motor mount.

This is what it looks like when you turn it over.

Photo 126: Back side of the motor mount.

Photo 127: Temporary attachment of the motor to the mount.

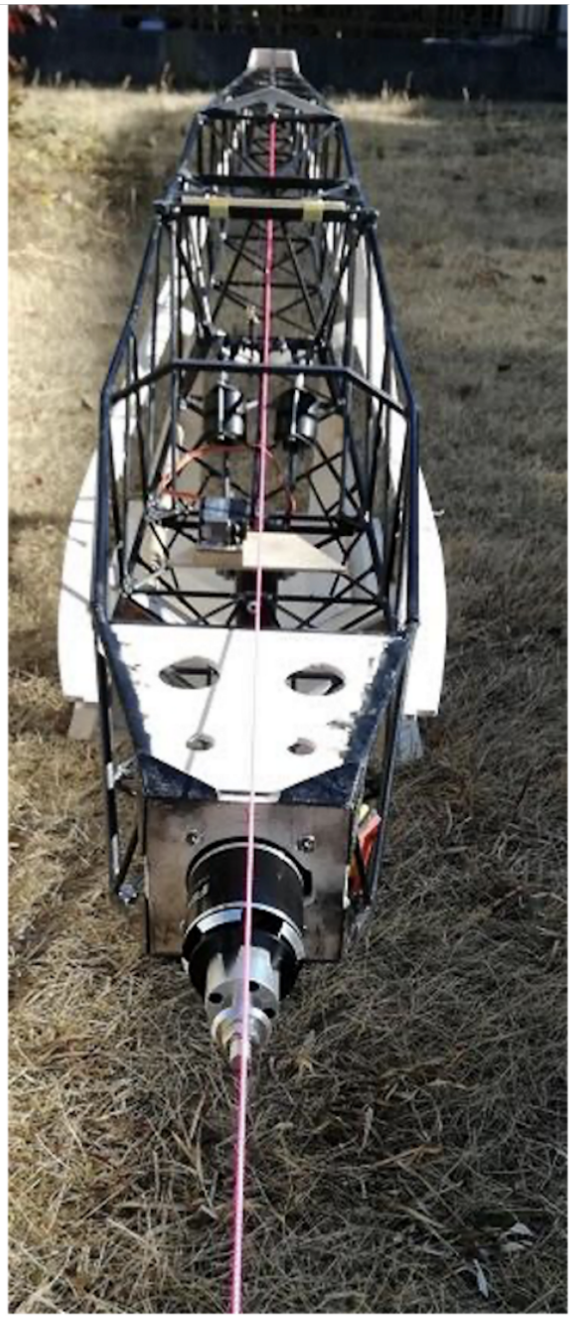


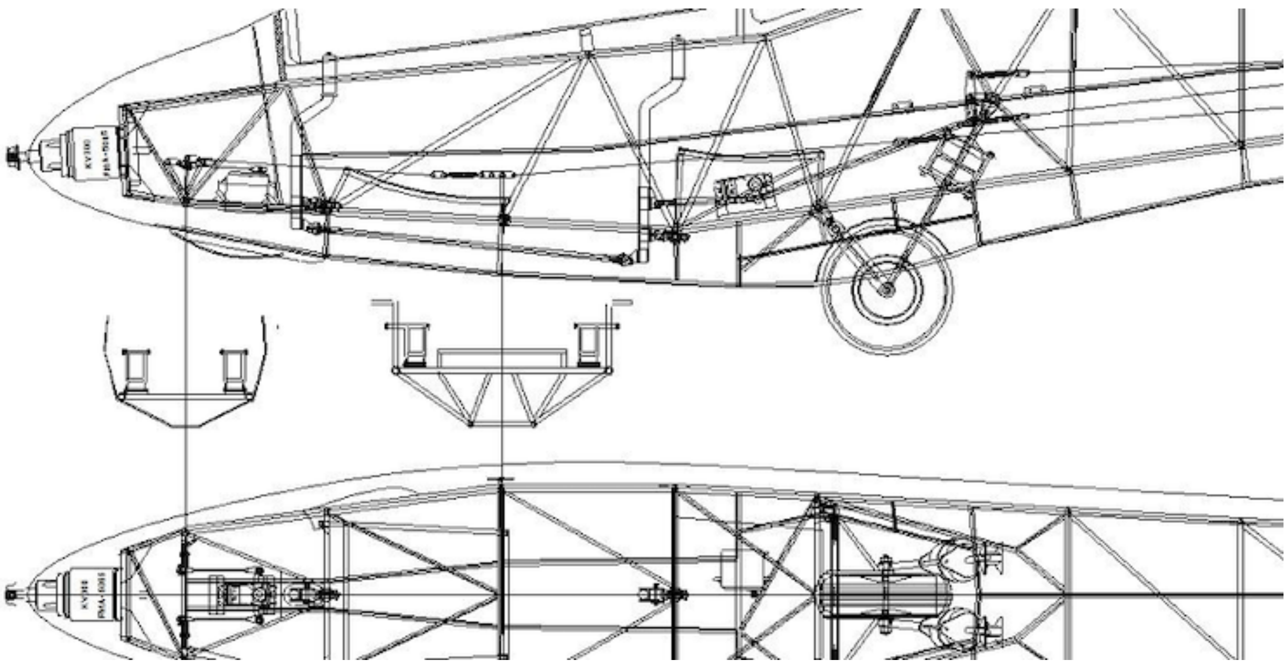
Photo 128: Checking the motor shaft position.

The placement of the motor shaft on the central axis of the fuselage, which was my main concern, also worked out well (Photo 128). Thanks to the diagonal members and the triangular reinforcement plates, a very rigid mount was completed.

Fabrication Part 25 Rudder Control System

Rudder Control System of the Mita Type 3

The rudder horn, located at the bottom of the rudder, is operated by pull-pull wires extending from the pedals of the front and rear seats. A total of four turnbuckles are attached to adjust the length of the wires, two to the front of the rear seat pedals and two between the rear seat pedals and the rudder horn. The former is used to adjust the length between the front and rear pedals, while the latter is used to adjust the length between the rear seat pedals and the rudder horn. The drawing looks like this.



Drawing 34: Rudder control system.

Making the Pedals

The first thing I did was to make the pedals. The pedals of the real model are made of short steel pipes welded together, so I soldered 3mm diameter brass pipes on the model.

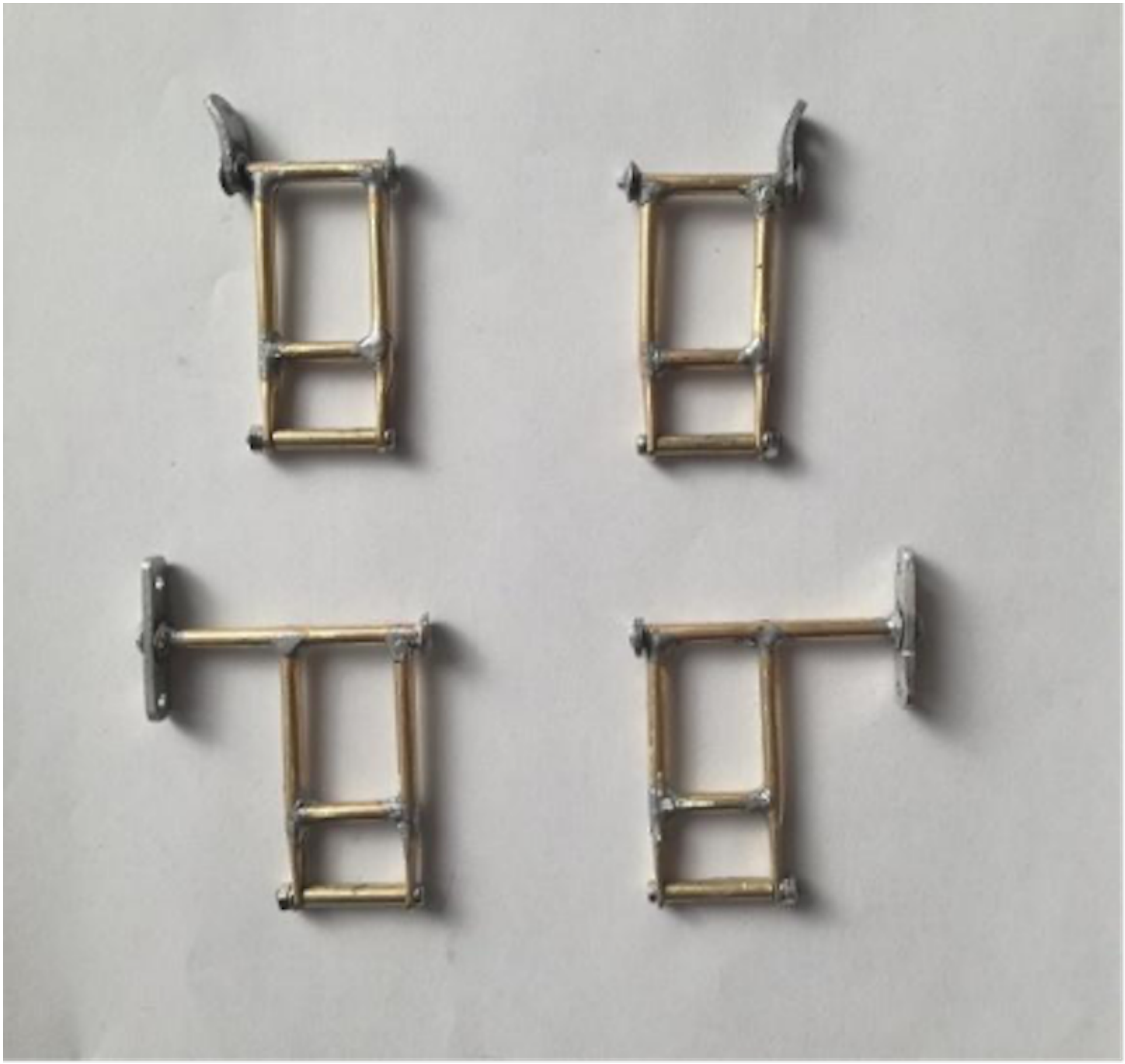


Photo 129: The rudder pedals I made.

The top two are for the front seats and the bottom ones are for the rear seats. The wire between the front and rear seats is stretched outside the basic structural steel tube, so the wire attachment points on the top of the rear seat pedals extend outward. These pedals are actually reproductions of the original. It was difficult to grasp the actual size of the pedal from photos, so I assumed that they would be about 15cm long, and made pedals 1/3 of that size. When I installed them, I found that they were too big. So I re-made them to 2/3 of the original size. When I saw the actual aircraft, I was surprised to find that its size was smaller than I had expected. It seems that my image of a voluminous aircraft makes me imagine everything to be large.

Mounting

The pedals are now in place, wires are strung and turnbuckles are attached.

Photo 130: Installation of pedals Left, front seats. Right, rear seats.

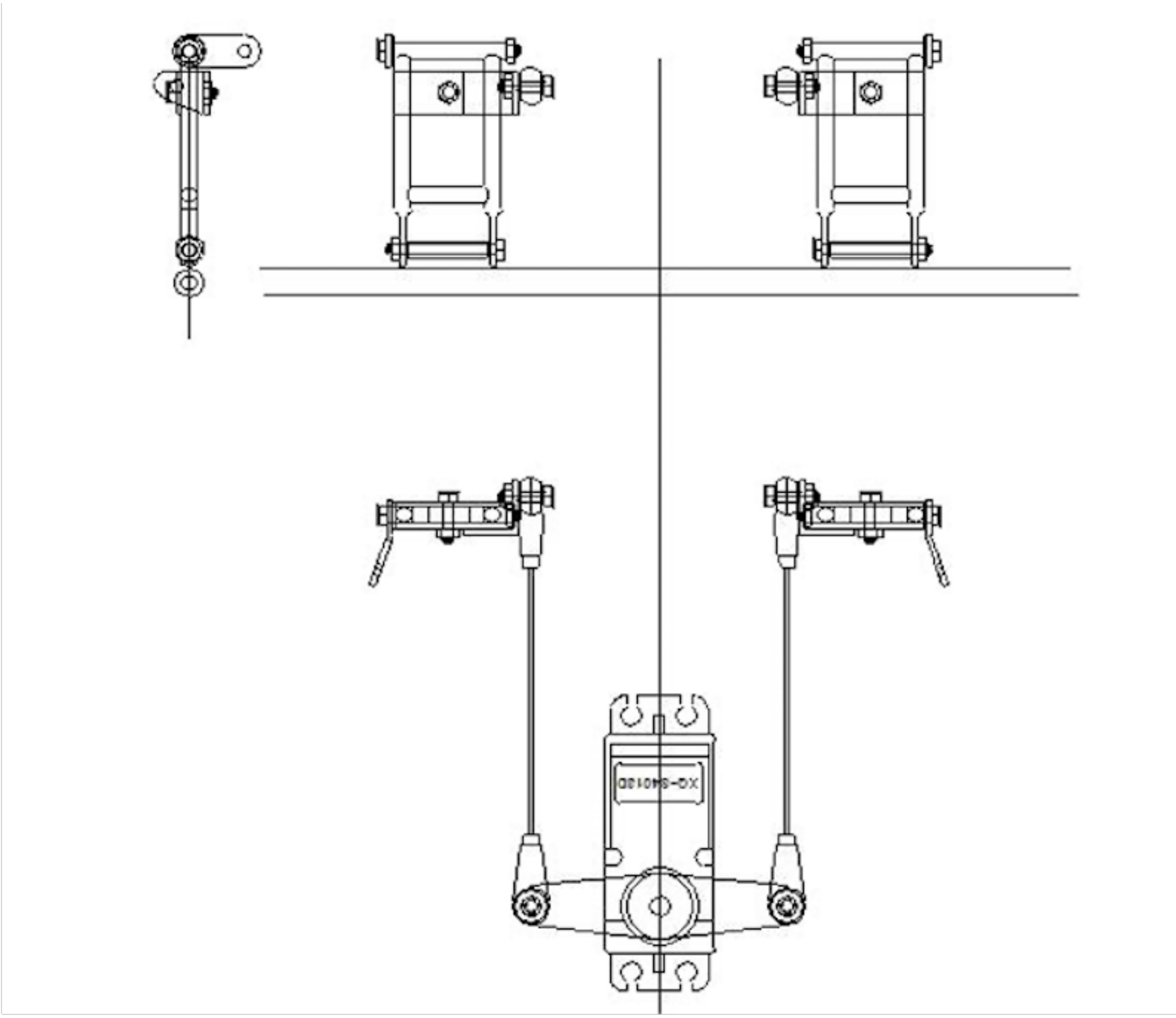
The rear seat pedals are fitted with turnbuckles. These turnbuckles are the same as the one used in the elevator control system, and was made by a fellow club member who is good at metal working. Another turnbuckles are attached near the main wheel behind the rear seat.

Photo 131: Rear turnbuckle.

Two wires extending from these turnbuckles to the back connect to the rudder horn, but they are not connected to the horn yet because they would interfere with the fuselage skin. When I was stretching the wire, I noticed that there are many places where the wire intersects with the fuselage structure. I had thought that the original designer of this glider would have to be more careful in designing the places where the wires would pass through the structures so that they would not collide with them, but in the Mita model, he decided to avoid this problem by simply installing pulleys (details unknown) at the places where the wires intersect the structures to avoid rubbing. Instead of pulleys, I attached noiseless tubes to the relevant locations to avoid rubbing.

Installing the Rudder Servo

The rudder servo is installed in the nose of the plane. It is used to move the front seat pedals. Since the instrument panel will be installed in front of the servo from the cockpit side, the servo is expected to be hidden behind it.



Drawing 35: Rudder servo linkage drawing.

Two links connect the boards attached to the pedals to the servo. These are the pilot’s feet. The servo mounting method is ingenious. The nose of the glider, where the motor is installed, is covered by an FRP cowling, and the motor can only be accessed from the cockpit side. In this case, the servo would be in the way. So I attached a mount to the servo and fixed it with a

45-degree screw. This is the completed rudder servo mechanism.

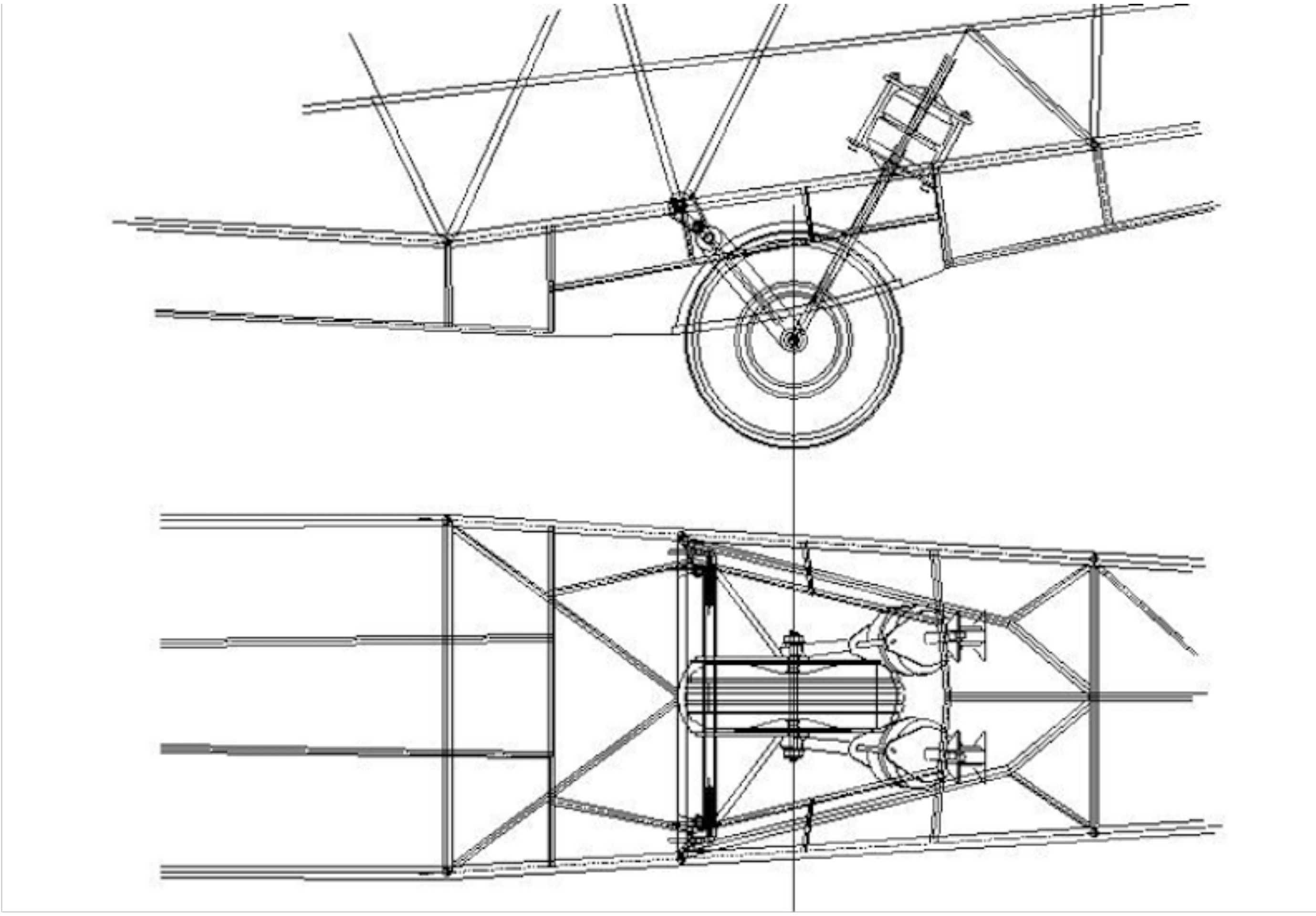
Photo 132: Installation of the rudder servo.

Note: At this point, I was thinking that the FRP cowling on the nose should be non-removable like the 1/5 model, so I decided to use this rudder servo mounting method. However, since the cowling was changed to be removable later, there was no need to do so after all. The same servo is used for rudder, elevator and aileron. Its specification is as follows.

Model:	XQ S4013D	Digital Servo		
Torque:	12.5Kg-cm	(@4.8V)	14.5Kg-cm	(@6.0V)
Speed:	0.13sec	(@4.8V)	0.11sec	(@6.0V)
Weight:	56 g			
Size:	40×20×39㎜	(L×W×H)		
Motor:	Coreless			
Gear:	Titanium			
Bearing:	Double ball bearing			

Fabrication Part 26: Lower Fuselage Structure around Main Landing Gear

I asked the Shizuoka Aviation Museum to send me photos of the structure around the main landing gear. By these photos, I imagined the structure and designed it.



Drawing 36: Lower fuselage structure around main landing gear.

This structure emerges from the center of the trapezoidal-shaped front fuselage lower overhang structure and connects to the center of the triangular-shaped rear fuselage overhang structure. When viewed from the side, it is a straight line, but in the plan view, it bends into a large "V" shape. This is because it must cover the wide forward attachment members of the main landing gear.

A fabric wheel cover will be attached to the lower part of this structure. This time, I made the truss structure part.

Fabricated Structure

I made the 'V' shaped member running back and forth with 4mm diameter carbon pipes. The two pipes were connected on a jig at a precise angle. Stainless steel rod was placed inside the joint and hardened with epoxy adhesive. The pipes were mounted on the fuselage using a positioning jig to ensure symmetry, and the support members were glued on. Photo 133 shows the result of this process.

Photo 133: Lower structure of the fuselage around the main landing gear.

You can see it bends and sticks out in a big 'V' shape. However, a big concern arose at this point. The shape change from the lower part of the front body to the lower part of the rear body is too drastic. The angle of inclination of the truss members changed abruptly when viewed from the front. I was worried that this would cause wrinkles when the fuselage was covered with cloth.

Trial Application of Cloth

Then, I tried applying cloth to the area where the shape changes rapidly. I used Oratex, which is a silk-grained Oracover. I was relieved there was no need to worry, as shown in photo 135.

Photo 134 (left): Structure around the main landing gear seen from the front. **| Photo 135** (right): Trial application of the Oratex.

*This is the sixth part in this series. Read the **next article** in this issue, return to the **previous article** in this issue or go to the **table of contents**. A PDF version of this article, or the entire issue, is available **upon request**.*