

Gloster F. 5/34 and A6M Zero Fighter

—Enigma of Jiro Horigoshi and
his design roots—

Jiro Anzai

On the 48th Congress of the Japanese Psychological Association held at Osaka University's Matchikaneyama campus, on 14th September, 1984, I had not only acted as a coordinator of the Principle Section, but also read a paper on the British Gloster Experimental Fighter F. 5/34 and the Japanese Navy's carrier-based fighter Zero A6M's prototype. Telescoping the matter, I have compared nine other single-seat monoplanes of the days, ranging from Spitfire Mark 1, Curtiss P40-A, Seversky P-35, Vultee Vanguard V-48B, Grumman F-4-F3, and Vought V-143 to two Italian fighters, all together nine of the monoplane fighters, and come out with the only one plane, in about 18 vital parts, that earned 15 points of similarity, the while the two others scoring 9 points, three others 6 points, and finally three others getting only two points in smilarity score. Of these comparisons, the sole aircraft that scored 15 points was no other than the Gloster Experimental F. 5/34, as shown in the chart.

For all this, my tentative conclusion was such that one could not possibly have called it an exposé of debunking nature; in fact, at the time I was more or less asking for the real aeronautics expert to examine the case presented. Either its very nature had been taken as one verging on the exposé of debunking nature on the Japan's No.1 aircraft designer of the celebrated fighter of the World War II or Zero, or else my country men were no longer interested in pressing the issue to the original root, for a while my quest had seemed to have fallen on stone ears. Nevertheless, I kept searching and researching this matter until my desire to get at the root was so enhanced that I resolved to visit England: it so happened that it was about this time some ex-RAF veterans who have heard of my work had wired me to know what I had said in that congress; this move throttled on my activity, no doubt; but at about the same period I had published my 5th Japanese book entitled "Battle of Midway — a psychological interpretation," from the PHP, the famed Matsushita Electric Works' affiliated publishing house. To cut the preface short, I visited the RAF Museum at Hendon, and presented a copy of this to Assistant Gordon Leith there, and Mr. Leith was kind enough to have given me some of the basic material concerning the said Gloster F. 5/34.

During-our chat, the point that has been sticking to my mind again came to the surface;

that is, be it Sidney Cum's Hurricane or Folland's Gloster, or Mitchell's Supermarine Spitfire, when their designed craft had been lined up chronologically, there seem to have been a peculiar colour and thread which can be identified as something idiosyncratic peculiar to the particular designer's, a sort of engineer's Scarlet Thread. What seems to be so odd is for all its remarkable exploits as the actual service fighter, the Zero's very configuration is such an abrupt break from the Type 96 carrier-based fighter or the Zero's predecessor, and the interceptor Raiden or the Zero's immediate successor-to-be, (also designed by Horigoshi, another complete break-off from its predecessor). How is it that in the two out of three, each successor had taken an entirely different configuration, and in each case, even though the world at large had mercifully forgotten, there had been in the Allied camp, the resembling prototype-like crafts on the experimental stage, whose specs and pictures had been published not only in Jane's *All the World's Aircraft* some years before, but also in other aviation magazines.

CHILDHOOD ENCOUNTER

It was sometime after the Fall of Singapore, that the publisher by the name of Sankaido, which translated means Pavillion of Mountains and Seas; as their name betrays they published widely from sea to mountain, specializing in engineering books, aircraft and other motorized craft, including the versions for school children. This company in the intent of crowning the exploits by the Japanese Imperial Army and Navy came forth with the special appendix issue, which turned out to be a copy of the Allied Aircraft brochure filled with line drawings, with brief performance data; for all its ominous naming of the top secret stamp, it turned out to be pages of line or skelton drawings of various aircraft, with usual specs of performances; nevertheless, my elder brother and I had been poring our fascinated eyes on every page of this booklet, and Gad! on one of our eager turning we came across to the configuration of the fighter plane whose streamlined shape, taken as a whole looked so much like the configuration of the then-released-to-the-public picture of the IJN's new carrier-based fighter plane or A6M Zero fighter!

At the closer scrutiny my brother discovered this darwing's craft had quite dissimilar undercarriage, with the equally disimilar layout of the vertical tailplane against the horizontal tailplane; moreover, compared to the Zero's gracefully slenderized tail cone that housed the retracted tail wheel, this one or Glosetr Experimental F. 5/34 had a funny-looking sausage-like tail cone, as if it had swallowed Alice's puffing-up pill! For all that, inasmuch as there are indeed some 15 points of similarity between the Zero and Gloster as I had come to discover some forty years later, our on-the-spot insight cannot be dismissed as a mere child's fancy.

For some thirty four years after the V-J Day, Bill Gunston's *Classic Fighters* came out to say as follows:

Mitsubishi A6M

In all important respects the design of this carrier-based fighter of the Imperial Japanese Navy was ordinary to the point of being old-fashioned. It was, for example, almost identical in size, shape, weight, engineering detail design and performance to the British Gloster F. 5/34 flown in December 1937, almost 18 months before the Japanese fighter¹

To be sure, there have been many articles and books including Ziro Horigoshi's that proclaim the similarity is superficial, and in fact a lot of ingenuities are woven into the craft, designed by him.

For all that, there are several matters that had crossed my mind, the facts which I could not so negligently pass by, little as I know about aviation, aerodynamics and its engineering details.

OF THE ANTI-SPIN MEASURE TAKEN

Of the plane's anti-spin tendency, Dr. Horigoshi says as follows:

Concerning spin, the vertical windtunnel tests at the Naval Technology Establishment proved that the original Zero fighter design did have the tendency of getting into a flat spin from which it could not possibly recover. To rectify this some assessments were made to the tail configuration; that was the back-ing away of the position of the vertical tailplane, and bringing upwards the position of the horizontal tailplane, thus enhancing the directional stability of the aircraft at a greater angle of attack²

When said in a technical jargon, there seems to have been nothing so extraordinary but had one taken a second thought and tried to envisage from the above-mentioned description what might have been the original tail configuration in respects to the fuselage, one would have seen a certain configuration the shape of which nearly superimposes that of the Gloster F. 5/34 made in 1937.

For had we forwarded the vertical plane of the present-day remaining Zero's tail, the relation of the vertical tailplane closer to that of Gloster's tailplane configuration, and likewise the lowering of the horizontal tailplane spreadout alongside the aft fuselage, would have come one step or more closer to the extraordinary tailplane position realized on the 1937 Gloster Experimental.

Only difference prominent is, even assessed thus far, that sausage-like configuration; but had that contraption been a hidden container in which antifat spin parachute concealed, which would open automatically as in case of another British military aircraft *Blackburn Scua*,

1) Bill Gunston, *Classic Fighters* (London: Hamlyn, 1978), p.100.

2) Jiro Horigoshi and M. Okumiya, *Zero Fighter* (Tokyo: Kyodoshuppan, 1953), p.77.

the story would have taken an altogether different picture. This possibility, I had already suggested in my Osaka University deliberation. When taken in this shade, what seems to have been Dr. Horigoshi's meticulous description takes entirely a different hue. Why did the Zero's prototype or the first model put into the windtunnel tests develop an unrecoverable flat spin? Is it not because Horigoshi had gotten an inspiration from the configuration of the Gloster Experimental, but given no second thought to the blimp-like part, and only came to slenderized the original tail part, its end result was the flat spin?

Whether these meticulous description by Horigoshi were something close to Dr. Sigmund Freud's slip of tongue or the designer's unconscious effort at setting facts as facts, I am not in a position to know. But these facts remain to be wanting a proper assay by the genuine aviation expert for trial of fire examination.

What about the Raiden Interceptor and the Vultee Vanguard's 61? There are also a strange similarity between the later materialized production service craft Raiden designed by Horigoshi and the preceding Experimental Craft by Vultee that ended in the experimental stage.

As days progressed so rapidly in the wartime years, the tide of war or fortunes began deteriorating rapidly for the Japanese, so rapid was our sinking that pretty soon both my brother and I were found ourselves at factory lines as mobilized student workers; this naturally drew us closer to the world of air-craft productions, and on our sparse holidays, we again began poring over the new as well as back issues of aviation magazines. During this period I also got a jolting experience of encountering; it was late 1944 or early 1945, our Newspaper flashed a picture of the Navy's new interceptor by the name of the *Raiden* (Thunderbolt), while my colleagues were hotly discussing about the picture image of this newly released fighter that should bring down a lot of enemy bombers as well as fighters, I had been wondering with a feeling of *déjà vue*, that feeling one would occasionally get when one is exhausted. I must have seen somewhere, an interceptor like this. Yet I could not quite track it down, and as soon as I got home, I started to track it down, getting out all those back issues of the *Koku Asahi*, until I came up to several of them. The configuration of this interceptor is so alike to that of Raiden, its name was American Company Vultee's Vanguard 61, again an experimental Aircraft.

I had stifled my mouth when I came to the picture, because this time again the total configuration, its shape of landing gear, wheel's arrangement even to the completely retractable tail wheel with its split-open doors, looked so alike; moreover, unlike Zero's clearcut latticed canopy or cockpit, this one had the latticed cockpit part that continued with the rest of aft fuselage in one piece (this had been at least two years of the Pacific War the Allied fighters characteristics/In turn the Allied war defense manuals used to emphasize, that bulged out, clearcut bubble canopy as distinctively Japanese). For on this point, this Raiden is a seeming copy of the Western tradition; moreover, as we found after the war, both the interceptors had extended long propeller transmission shafts, with extremely deep and curved

Zero A6M1 Prototype	Other Monoplane Fighters Gloster F. 5/34	Spitfire 1	Curtiss P-40-A	Seversky P-35	Fiat-50	Macchi-20.0	Vultee Vanguard V-48B	Grumman F4F-3	Vought V-143	
Propeller & Spinner										
Cowling & Air Intake										
Canopy & Cockpit										
Fuselage Configuration										
Main Wing										
Vertical Tailplane										
Horizontal Tailplane & Elevator										
Main Undercarriage & Tailwheel										
Wing Span (m)	12	○	×	×	×	×	×	×	○	×
Total Length (m)	8.7	×	×	×	×	×	○	○	○	×
Total Weight (kg)	2,343	○	×	×	×	○	○	×	×	×
Wing Area (m²)	22.44	○	○	○	×	×	×	×	×	×
Loading	100.3	○	×	×	×	×	×	×	○	○
Speed (k/h)	508.8	○	×	×	×	×	○	×	○	×
Power Plant (HP)	875	○	×	×	×	○	○	×	×	×
Similarity Scores		15	2	2	2	6	9	9	6	6

(○=1 point each)

Superficial Similarities between Zero and other fighters of the period (1936~1941)

Data assessed by Jiro Anzai.

cowling around air-cooled radial engines!

But the similarity hunch of mine was only limited to the outward configuration, and yet I swore myself that I would not slip this find even to my brother, for the deteriorating war situations fanned the witchhunting antispy campaigns so much so that I was scared to death for even harbouring such a find. By then even girls' school kids had been dragged into factory lines, some of them even given the very honour of servicing the military planes in airdromes; moreover, only a month before I had been disclosed from a beautiful elder girl of 17 years; my relative, that she had been left tied, with her hands and feet in one, by her fencing teacher on account of her having spilled a vital information concerning the military situation, this accused spilling turned out to be just deploring of the worsening situations, in which there were so many mechanical bugs developed that very few service craft could ever reach even the second lines.

With the war over, my line had of course shifted to other direction, and having turned myself a historical psychologist with special interest in the British History, my smothered interest in the history of the RAF returned.

Then one day I came across what seems to be an absurd account³ written by the very popular nonfiction writer Kunio Yanagida, the while showing a paean of praises on the Zero fighter, it went to overshoot until it gave a lauding hand to Horigoshi even for his adapting the elongated shaft into the Raiden as an evidence of his ingenuity. And this caused me more than anything else to set the records right.

Indeed, another curious coincidence seems to have been occurring in the less-known but equally credit-given (among the Japanese circle) interceptor designed by Dr. Horigoshi.

Here again, even the original performance specs are not so far dissimilar, with the Vultee Vanguard Experimental Fighter (again remained as the prototype stage and faded into oblivion) also preceeds some three years the appearance of the Raiden. But again, its basic configuration markedly resembles, this time in such the important detail as the use of extended propeller shaft, and now complete with the canopy and aft fuselage as one-piece dorsal line configuration!

About specs, the Vultee's wingspan is 10.70 meters as against the Raiden's 10.80. Overall Length of the Vultee is 8.90 meters as against 9.47 meters of the Raiden; one would question 57 centimeter difference anyhow, but here we have to think that the posterior can always benefit by refining on the prototype, provided the copier has enough skill to copy, which certainly within the designer's ability. Weight-wise, as against 2,272 kilograms of Vultee 61, our Raiden is 2,861 kg, which means an additional 140 kg weight added: again, this can be easily accountable for the heavier armament installed in the actual combat service craft with extended fuel capacity enforced by the Japanese Navy.

I may be too quick to form a hasty conclusion; on the surface it may seem so; but I

3) Kunio Yanagida, *Zero Fighter* (Tokyo: Bungeishunju-sha, 1985), p.155.

4) *Jane's All the World's Aircraft*, 1938, 1939, 1940 and 1941 Editions.

earnestly urge the reader to have more patience and follow the lines with me to the end.

One of the fact that I cannot possibly swallow is stemmed from the existence of the brazen-faced statement by some Japanese to the effect that extended propeller shaft transmission were as if of the said Horigoshi's ingenuity; Lawk a mercy, there had been at least several attempts before his adaption. For example, American Bell Aircraft Corporation's P-39 Airacobra is one of the service aircraft that had been flying actual combat missions all over the world, the fact it had been no match for the Zero in the Pacific Theatre should not negate her technological achievement; in fact, the Airacobra was far and wide known as the early successor in realizing not only the extended shaft transmission but the inner-shaft 37 mm cannon through its center axis, thus turning herself the most formidable anti-tank buster in the later stage of war.

The readers even at this point would say, to the effect that what you are trying to is a thankless task, you are heading towards the precipice from which you are bound to jump; others would come out to say there already have been a cloud of witnesses to endorse the innovative genius in the person of the late Dr. Horigoshi, and who are you to criticise such the great man with a paeon of praises even from the Hurricanes' Sidney Cum that had lauded Dr. Horigoshi for his innovating "Reduced Rigidity Concept" of the control systems in Zero fighter, and many other Japanese Navy's service craft.

Yes, it is just on the same ground I would like to argue. For even though less known as the able designer and better known as the miserable guy that had designed the illfated Type One Attacker (Betty Bomber in Allied Code name) has to say as follows.

Speaking on the Type 0 Reconnaissance Seaplane designed by Eitaro Sano, Honjyo says as follows:

The most prominent feature of this plane (Type 0 Observation Seaplane) is the fact that it is designed by a little man whose formal educational history extended no further than the compulsory grade school level . . . The man that had hand-picked this Engineer Sano was none other than the Design Department's section chief Mr. Hattori, himself a graduate of Tokyo Imperial University with an Empror's silver watch for his excellent achievements; it was Director Hattori that had placed Sano as the chief of the team responsible for that fine aircraft or Type 0 Observation Seaplane . . . Cheif Designer Sano is a remarkably likable man, willing to accept advices from the college graduates that had studied aerodynamics as science . . .

Moreover, while testing this plane, he had come to discover a rare phenomenon, thus contributing greatly to the adavance of aviation technology. This is something to do with rigidity of control system in the aircraft . . . in the end he had come to solve this problem by means of reduced rigidity concept! Engineer Sano is the first man who had ever taught me there is such a phenomenon as that⁵

5) Kaikukai edit., *The Wakes of the Naval Eagles* (Tokyo: Hara-shobo, 1983), pp. 65–66.

Had this gentlemanly Honjyo's saying been true, which must have been true, Professor and Dr. Horigoshi's grand statement about the concept of Reduced Rigidity as his own would come to a grave doubt as to its originality.

The above, however, is not only an incidence spoken rather protestingly by his twenty-seven pages of the exposé (tucked into a huge volume contributed by other aerial experts of the by-gone days, the volume happens to be titled *The Wakes of the Naval Eagles*, published from Hara Shobo, in 1982.

Honjyo in fact inserted other passages by which he seems to be wanting to claim the true credit for his Zero fighter's contribution. It runs as follows:

Upon completing the series of the test flight for the Zero, Dr. Horigoshi said guffawingly, "The final ideal ratio I got turned out to be the very one recommended by you from the start."⁶

Now Honjyo's talk goes on, in detail, and as we read them carefully, there can be no doubt about the statement's credibility that the ratio of the horizontal tailplane (or the area of tailplane itself) to that of the elevators is none other than the ratio drawn out of Honjyo's experiences and theorizing; in fact on the same page, Honjyo goes on to declare,

This ratio is the figure obtained by me through theorizing and actual experimenting, the ratio obtained by me on the medium attackers which I had designed, and proposing ever since for others to adopt. The Zero fighter is the first fighter craft that heeded to my insistence, and my point of years long insistence has been amply proven even in the Zero fighter!⁷

Put into a straight jargon, I cannot but say that not Horigoshi, but Honjyo had designed the area of rudder surface to the tail plane ratio, and it is in this part that the Zero has made a definite and unmistakable break-off from the Gloster F. 5/34.

Put into another phraseology, I would say that like any other complicated piece of work such as modern-day airplane, a lot of other peoples' works have been incorporated, into almost any piece of engineering that there indeed can be no one that can claim "I solely designed the Zero fighter!"

(To be continued)

My great thanks go to Miss Bailey at the British Library for her thoughtful source illumination, and several other efficient members that have provided me all *the Jane's* at the Science Reference Library. I am also extremely grateful for Assistant Gordon Leith at the RAF Museum, Hendon, who has most kindly assisted me in securing the Gloster material.

6 & 7) *Ibid.*, pp. 61–62.

Derek N. James, *Gloster Aircraft since 1917* (London: Putnam, 1987).