Slingsby Sailplanes by Martin Simons: part 3

The Vega within the development of glass ships

Drawing and text are from Slingsby Sailplanes by Martin Simons with kind permission of the family. My comments in [].

From velero.net

The Standard Class is dead,' wrote Mogens Petersen, a former chairman of the Danish Gliding Union, late in 1975. Though his opinion proved false in the long run, it was shared by many in the gliding movement at the time. The Standard Class of competition sailplanes had been established by the CIVV (gliding commission of the Federation Aeronautique Internationale) in the 1950s. The original formula was straightforward. The span was limited to 15m, and there had to be speed-limiting airbrakes, a non-retractable landing wheel, no wing flaps, no water ballast tanks and no complications. The outstanding exemplar was Rudolf Kaiser's design, the Ka 6. No other sailplane since the old Grunau Baby has ever been produced in such quantities.

Bit by bit the rules were eroded. To save drag, undercarriages in some designs were so deeply buried in the belly of the fuselage that they caused poor take-off behaviour and gave inadequate protection from damage in field landings on rough ground. Retracting wheels were safer, caused less drag and were only a little more expensive. The Standard Class specification was changed. Such aircraft as the Standard Libelle and the Standard Cirrus resulted; glass-plastic aircraft with excellent performance, cheaper than the huge Open Class types and very popular. Then water ballast was permitted. Existing sailplanes could be adapted without too much cost, and the advantages in operational flexibility were worthwhile. There were few protests.

The next relaxation came close to destroying the Standard Class concept altogether. It was argued vigorously by some designers that simple trailing-edge flaps that could be lowered to 90°, as used on Richard Schreder's HP-14, were simpler and cheaper than airbrakes. This was true. Housing the usual vertical parallel- ruler type of brakes in the wings created many structural difficulties. Brake boxes and skin discontinuities in the wings created stress concentrations. Opening, closing and locking brakes shut required quite complicated mechanism, and sealing them properly against air leakages when closed was difficult. When the brakes were open the lift load distribution changed markedly, throwing more load on to the outer wing panels. The CIVV [Commission Internationale du Vol à Voile – 'vol à voile' translating to 'fly with sail'] changed the rules again to permit flaps, providing they were not coupled with the ailerons to change the camber across the whole wingspan. The idea was that they should be used only as brakes, but there was no way the Commission could prevent a pilot using the flaps to vary the wing camber in flight, gaining some aerodynamic advantage both in the climb and in high-speed glides.

In the 1974 World Championships, held at Waikerie in Australia, Helmut Reichmann of Germany flew the LS-2 with flaps conforming to the new rules. In this sailplane the ailerons were truncated to a bare minimum, allowing the flaps to extend over most of the span. The rules had nothing to say about this. Handling during the slow phases of take-off and landing verged on dangerous, and the rate of roll was poor, but Reichmann won the championship by a small margin over Ingo Renner in a Standard Cirrus. Ironically, on the 11th and last day, at the start of which Renner was leading, the Cirrus developed a problem with its airbrakes, which would not lock closed properly. This delayed and slowed Renner down enough to let Reichmann and the LS-2 take the title.

It seemed that all of the older Standard Class sailplanes were now uncompetitive. Aspiring champions would have to replace their aircraft with brutes like the LS-2. There were even suggestions that ailerons could be dispensed with altogether, to be replaced by wingtip spoilers for lateral control. Flaps then could extend from root to tip. The whole idea of the Standard Class originally was to produce a safe, practical and relatively inexpensive sailplane with a good enough performance for distance flights and competitions with other aircraft of similar performance. Reichmann himself made the point that the repeated rule changes had done serious harm.

The CIVV thought again. At the delegates' meeting in March 1975 the Standard Class rules were put back to where they had been, but at the same time an entirely new class, the unrestricted 15m or, as it was immediately termed in illogical popular parlance, the Racing Class, was announced. (Illogical because all modern gliding competitions are races.) It was believed that the unrestricted 15m class would become most popular, surpassing even the Open Class in prestige. What might emerge in the way of complications and expensive machinery remained to be seen. The new rules were to take effect after the next World Championships in June 1976.

George Burton was full of enthusiasm for the new class. In the 1976 World Championships he flew the Finnish designed Pik 20 (with flaps as permitted under the 1974 rules) to third place in the Standard Class, and beat many of the large Open Class sailplanes when flying against them on the same courses. He broke the world record for distance over a triangular course with a flight of 720km (446 miles). Immediately after returning from Finland he made a proposal to his chairman, Sir Leonard Redshaw, for the design of a new 15m sailplane using a carbonfibre spar and new combined flap-airbrakes which he had outlined in talks with the Glasflügel company the previous year. (This ingenious flap design was incorporated in the Glasflügel Mosquito.) The fuselage would be based on the Kestrel, but without the excessive waisting which had caused so much aerodynamic trouble. Redshaw, now in his last year before retirement, agreed funding of £250,000 for the project. The technical department estimated the aircraft would be ready for test flying within one year.

Slingsby's accordingly announced the Type-65 Vega. Deliveries were promised for June 1977. More capital was invested in tooling than for any other British sailplane, in an effort to keep the labour costs down.

During 1976 a whole new crop of 15m Racing Class sailplanes appeared. They were based on the old breed, often using the same fuselages and tail units but with new wing profiles and flaps, ailerons coupled. The Mosquito and LS-3 (a much more sensible design than the LS-2) were German, and from Finland came the PIK 20D, which had a carbon fibre spar. All of these were available before the end of the year. The ASW 20 from Schleicher came on the market in 1977, and the Grob Speed Astir, the Glaser-Dirks DG 200 and the Schempp-Hirth Mini Nimbus soon followed.

The Slingsby Vega was the first sailplane ever to be designed from the outset for a carbon fibre main wing spar, stronger and stiffer yet lighter than glass. The PIK 20D had inherited a 17 per cent thick wing root from the 20B, so was not taking full advantage of the new material. The Vega wing was 15 per cent thick throughout. The Wortmann profiles were similar to those of the Kestrel and all the other contest sailplanes of the period. Balsa wood was no longer used for the filling of the sandwich skins, having been replaced by plastic foam. There were, of course, flaps with ailerons coupled to vary the camber across the whole span.

For landing, the entire trailing edge inboard of the ailerons, earning the flaps, pivoted to present nearly vertical airbrake surfaces both above and below the wing. In normal flight the flaps could be moved independently for slow and fast flying. Burton had his own ideas about the mechanism, but had long arguments with the company's technical director and was finally convinced that the loads did not have balanced paths through the structure. An acceptable solution was found but it was complicated and seemed likely to create maintenance problems in the future.

Pilots were used to having two separate levers; one for the flap, another for the brakes. In the Vega one lever operated both controls. In the forward position the flaps could be drooped or raised as required for general flying. For landing, the lever was brought back through a gate and the full brake was available. The system gave some trouble in the prototype and was modified several times. In the final arrangement the flap settings were varied by moving the lever in a rotary sense, a spring-loaded latch holding them in any desired position. For opening the brakes the lever was pulled fully back. From the pilot's viewpoint the system worked well.

An interesting point was that the glass skin on the upper side of the flap-brake was continuous, forming a perfect seal. As the flaps were moved up or down through their range of 8° either side of central, the glass skin adjacent to the hinges flexed. The only visible discontinuity in the wing surface was at the forward edge of the brakes.

Provision was made for 100kg (220lb) of water ballast in plastic bags inside the wings, as had become normal practice. The amount of ballast permitted in the Vega was subsequently increased to 160kg (352lb), about the weight of two extra pilots. The fuselage front end and cockpit were based closely on the Kestrel. Indeed, the moulds were made from the same plug, but the somewhat too sudden contraction of the cross-section aft was smoothed out, avoiding flow separation. The canopy was in one piece, pivoted at the front and held open, when required, by a gas strut. An inflatable pneumatic seal, pumped up with a small hand bellows after closing the canopy, was provided. The landing wheel was large, also coming from the Kestrel and giving more ground clearance and a higher ground angle of attack than any of the other 15m sailplanes. The fin and T tailplane used the latest rather thick but low-drag symmetrical profiles developed by Wortmann for such applications. The tailplane junction with the fin was particularly neat, a small section of the fin being permanently attached and faired to the tailplane so that there was no gap or leakage at the junction. A neat fairing closed the place at the top of the rudder where, on most other sailplanes, there was an awkward air trap. A little drag was saved by making the tailwheel retractable.

There were many other good features of detail. George Burton wrote and said on many occasions that there could be no vast margin in performance over the rival racing class aircraft, all of which were using similar wings, similar fuselages and of course had the same span. The combined effect of all the small improvements would make the difference. At the same time the cockpit was slightly larger and the tailplane a little greater in area, so the Vega would be more comfortable to sit in for long flights and more stable.

'Vega is cleana', 'safa', 'lighta', a 'betta glida', the advertisements said. Everything about the new sailplane looked good, and about 50 were ordered even before the prototype had flown. Vega was 'a generation ahead of its competitors', or was expected to be so when in production. The first flight took place early in June 1977, the month in which customers had originally been led to expect delivery.

Sir Leonard Redshaw retired and a new chairman took charge of Vickers-Slingsby.

Flight certification had to be completed and a lot remained to be done after the preliminary air tests. At the most forward position of the e.g. elevator authority was lacking. Further modifications of the flap-brake system proved necessary. Burton felt that everything must be completely right before he could deliver sailplanes to waiting customers, but the technical department of the company was greatly preoccupied and there were delays. The first production batch, it was now said, would be ready in the spring of 1978.

Most of the work going on at Vickers-Slingsby at this time was to do with marine engineering. The last of four miniature glass-plastic submarines was approaching completion, a one-man deep-sea diving apparatus was under development, and there was much going on in associated electronics. Equipment for naval minesweepers ranging from washbasins to engine mountings was being made. A gondola for a small airship was built and an order for 15 wooden T-61 (Scheibe Falke) motor-gliders for the ATC was filled.

As a result of a bargain between British Aerospace and the Romanian Government, the BAG One-Eleven airliner was to be built under licence by the ICA aircraft factory at Brasov and motor-gliders and sailplanes produced by ICA were to be sold in the UK. Vickers asked Slingsby to undertake this agency. Although the price was low, the IS-28M2 motor-glider, shown at Farnborough, was not easy to handle in a crosswind take-off and Burton was not impressed. The IS-28 and 29 Brasov all-metal sailplanes proved quite popular and, coming from a state subsidised factory, were offered at a good price on the British market.

The Vega, it seemed, was in danger of being squeezed out of the Slingsby works altogether. In March 1978 there was still only one complete, with a few pre-production fuselage shells waiting for wings and tails. Derek Piggott flew the prototype a few times briefly and reported favourably though cautiously.

The World Championships, held every two years, are important occasions for sailplane manufacturers to demonstrate their wares and to have them thoroughly tested under severe conditions. On the ground, quick rigging and de-rigging after outlandings are necessary, and aerial racing goes on in all the variety of weather conditions that can appear during a couple of weeks. In July 1978 the great meeting was at Chateauroux in France. The Racing Class contest was won by Helmut Reichmann, flying a very special aircraft from the Brunswick Akaflieg. The SB 11 had huge flaps which not only changed the camber but also increased the total wing area for soaring and retracted entirely for high-speed flight, It was an expensive, heavy aircraft and not easy to fly. It looked as if the rulemakers had once again created a monster. Reichmann himself wrote afterwards that the CIVV needed to think yet again.

The Vega was at last said to be ready, but not for contest flying, and the British team could not use it. The second off the production line was brought to Chateauroux only for demonstration. There were signs of hasty preparation. Unlike the other sailplanes, which had the usual moulded gelcoat exterior, the Vega had an acrylic spray-painted finish. In places there were paint runs that had not been rubbed down, which, whether or not they had any important effect on the boundary layer, did not impress those who inspected the aircraft. The ailerons hinge gap was unsealed. The Vega was flown by a good many people and was well liked on the whole, though the rate of roll was rather less than desirable, the unsealed ailerons feeling rather spongy. It was difficult to assess allround performance while the competing aircraft were far away on task, but as one of those who tried it remarked, 'with the proverbial ha'porth of tar it should be a very good ship'. For much of the fortnight the Vega was left tied down outside. It was hard to avoid concluding that the Vickers-Slingsby company was not very interested in what happened to it. The Vega was now well over a year late in reaching production and the market was melting away.

Meanwhile, George Burton had taken the first prototype to important competitions at Hahnweide in Germany, and in June, at the invitation of Slingsby's American agent Duane Sprague, he agreed to fly at the US Nationals. Delays in preparing his Vega for this event were such that the sailplane had to be airfreighted to San Francisco. From there, arrangements for Sprague to crew for him having fallen apart, Burton by himself was obliged to tow the glider in its trailer to Ephrata in Washington State. He was further delayed for two days by long arguments with his new company chairman over the transatlantic telephone. Too late for the start of the competition and without a proper crew, he nevertheless flew some of the tasks against the latest German aircraft. On one occasion he beat George Moffatt, the eventual winner in an ASW 20, round a 300km triangle, so the Vega was obviously a good performer, but there was criticism from the knowledgeable Americans of the smoothness and finish of the wings. The good results were attributed to Burton's well recognised skill, not to the Vega.

After these experiences Burton was forced to admit that the Vega was about 3 per cent worse in the glide than the ASW-20 and LS-3. Standards of wing profile accuracy at Kirbymoorside were not yet good enough. There was no other explanation for the apparent disadvantage in performance, for, as he had said before, there was little difference on paper between any of the Racing Class sailplanes at this time.

Soon after his return to Kirbymoorside, Burton presented the works manager with a copy of the German specification for the waviness of sailplane wing surfaces. His staff apparently knew something that he had not yet been told. The manager bluntly remarked that there was no intention of trying to meet such standards. It was clear that Burton s time at Slingsby was at an end. On 13 September 1978, after a final very brief interview with the chairman, he left the company. Nobody in the gliding movement was very surprised. Burton felt he had been made a scapegoat for production delays and defects in the Vega for which he was not responsible. His position was filled by Jim Tucker, a graduate aeronautical engineer who had joined Slingsby's in 1967, and had been technical director and lately marketing director of the offshore engineering division.

Outstanding orders for the Vega had not been met, but full production began at last and faithful promises of delivery in 1979 seemed likely to be kept. Late in April an open day was held at Slingsby, 'designed to repair the company's reputation with the UK soaring movement, which had become somewhat tattered during the three years of delays and disappointments from when the Vega was first announced'. Three Vegas were made available for flying and 17 had already been delivered to buyers, five of these in the USA. They were coming off the line at the rate of one a week. But, with rather ominous implications, Tucker said: 'as long as our aerospace activities continue to be profitable, there is no cause for winding them up'.

On the same occasion it was announced that there was to be a simplified, cheaper version, the Sport Vega, with flaps deleted and fixed undercarriage. Production capacity for 48 Racing Class and 12 Sport Class Vegas per year existed. A self-launching Vega was also projected. Interest revived, but in mid-1979 there came yet another change of ownership. Vickers at this time had an overdraft of more than £11 million and was under pressure from corporate shareholders to reduce it. Interest in acquiring the Kirbymoorside factory was shown by a company providing diving services to the North Sea oil industry, for whom Slingsby had made submarine equipment. The development costs of the Vega were set off against taxation and the company was sold, to be renamed Slingsby Engineering Ltd.

During 1979 there were competitions in Europe and the USA in which the Vega was able to show its paces. The reports coming from the pilots were not especially enthusiastic. Wally Scott, a former American champion, said he found that the Vega would climb well but lost to the German aircraft in the faster glides, which Burton had admitted a year before. Scott admired many of the smaller features, and it was agreed that the aircraft handled well and was comfortable and very pleasant to fly. Scott concluded: ‘The Vega may prove to be the most costly 15m ship of the lot, but ... it may be well worth it'. It was not at all clear what benefits the customer would gain by paying more. The contemporary German Racing Class sailplanes were also comfortable, handled well and performed slightly better. Scott welcomed the news that more ballast would be permitted in the Vega, which might produce the extra performance needed at high speed, but the fundamental problem of the wing surface accuracy was not addressed.

Very bad news came in August, Baar Selen, a Dutch pilot who had won the Standard Class championship at Chateauroux, entered his new Vega in competitions at Rieti in Italy. Flying at 120kt in moderately calm air, the Vega broke up. Selen used his parachute and escaped unhurt. There followed an intense technical investigation. The stressing calculations were checked and rechecked and Vega wings were subjected to renewed mechanical testing up to the ultimate negative and positive bending and under torsional loads equivalent to flight at 150kt. The first distressing discovery was that a batch of the steel wing root spigots, supplied to Slingsby by a subcontractor, had not been correctly heat treated, and these failed during the tests. All Vegas were grounded until those with faulty steel were found. The spigots were replaced at the expense of the contractor, who admitted liability.

But the spigots were not the cause of Selen s accident. The port wing had broken off about a metre outboard of the fuselage; the carbon spar itself had failed. More testing was done, and many spars were made and loaded without failures. Photographs were taken and eventually published showing a Vega wing on test bent like an archer's bow at full draw without breaking. At the end of all this it was still not entirely clear why the accident happened, although there was a suspicion that the aircraft had been overstressed during earlier stages of the day's racing, flying too fast in rough air. George Burton himself subsequently wondered if the the cause was, after all, wing flutter. The combination of a very stiff carbon spar with more elastic glass skins, as on the Kestrel 22, might have been responsible. More computing at last suggested that some slight reinforcement of the mainspar was sufficient. All existing Vegas were so modified and there was no further trouble.

Such a series of events coming after years of frustrations and delays did not help the Vega's reputation. It was not a cheap sailplane, and it had no measurable advantage, indeed some small deficiency, in performance. Production continued on a very limited scale to satisfy those few orders that had not been cancelled.

The Sport Vega prototype made its first flight in the spring of 1980, and was warmly praised by Derek Piggott after he had flown it. It was, he said, the best thing for many years, a relatively simple aircraft with excellent handling and robust construction, low maintenance costs and with a satisfactory performance for club flying and minor competitions, but there were plenty of rivals in the market for this type of aircraft.

The total of all Vegas and Sport Vegas built was 70. From an accountant's viewpoint, a minimum of 100 might have represented the break-even point. The company now was taking another direction. A further order for 25 T-61E Venture powered gliders came from the ATC, and an agreement was reached for building, under licence, the Foumier RF 6, a French two-seat light aeroplane. This entered production in 1981. Soon it was completely redesigned for fibre-reinforced plastic materials, and as the T-67 Firefly became an outstandingly successful product, in its latest form still in production in 1995 and exported widely. Slingsby Aircraft Ltd, after yet another name change, at last reaped the rewards of the experience gained with the new materials.

In 1982 it was announced that Slingsby was ceasing all glider production. It was not surprising news, although it was very sad. The gliding side of the business had made no profits since the late 1960s. The home market was said to be too small to support a local company in this very specialised business. An influx of cheap gliders from state-owned factories in Eastern Europe was also blamed, but it was not Romanian, Polish or Czechoslovakian manufacturers who captured the international market for high-performance sailplanes. In the affluent west there were plenty of pilots willing to pay high prices for performance gains of one or two percent. It was German factories and young men trained in the Akafliegs of German universities who prevailed, and in 1996 they still do so.

T-65 Vega data

Dimensions

Wingspan 15.00m (49.2ft)
Wing area 10.05m^2 (108.2ft^2)

Aspect ratio 22.4
Length o.a. 6.72m (22ft)

Wing sections
Root Wortmann FX 67-K-15 (15 per cent flap)
Tip Wortmann FX 67-K-15 (15 per cent flap)

Weights

Tare 236kg (520lb)
Flying 331kg(730lb)
Ballasted 508kg (1,120lb)
Wing loading 30.5kg/m 2 (6.2b/ft 2) to 50.5kg/m 2 (10.35b/ft 2)

Flap movement: up max. 8°, down (normal) 8 °.

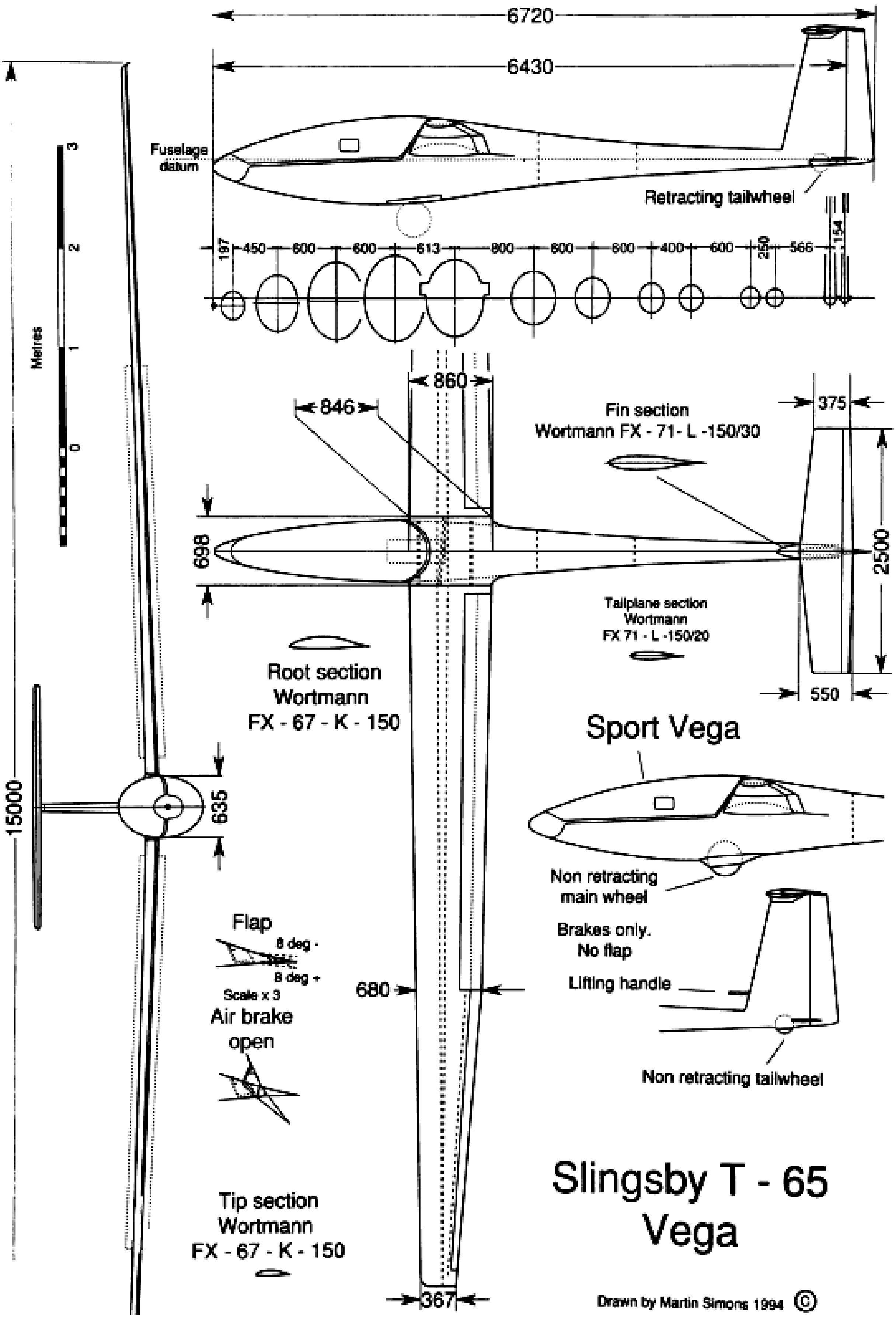
Sport Vega

Dimensions

As for Vega but no flaps, no water ballast, non-retracting wheel.
Weights
Tare 236kg (520lb)
Flying 354kg (780lb)
Wing loading 352kg/m^2 (7.2lb/ft^2)

[The beautiful model from designer Pat Teakle]

From gliderIreland.net


6720
6430
Fuselage datum
Retracting tailwheel
197
450
600
600
600
613
800
600
600
400
600
250
566
154
Metres
0
1
2
3
860
846
Fin section
Wortmann FX - 71- L -150/30
375
2500
698
Tailplane section
Wortmann
FX 71 - L -150/20
550
Root section
Wortmann
FX - 67 - K - 150
Sport Vega
15000
635
Non retracting main wheel
Brakes only.
No flap
Lifting handle
Non retracting tailwheel
Flap
8 deg -
8 deg +
Scale x 3
Air brake open
680
Slingsby T - 65
Vega
Tip section
Wortmann
FX - 67 - K - 150
367
Drawn by Martin Simons 1994 ©