

Trainer and utility model for REFLEX XTR

Telemaster

design by Karl-Heinz Denzin, rights Alexander Engel

»Nothing, nothing, nothing flies like Senior Telemaster!« Of course, this enthusiastic exclamation is advertising, but it should be sincere as well, even more than only a little. It's quoted from the old [Hobby-Lobby web page](#) on the Senior Telemaster. Designed probably 1967, this model is still available as a kit or even ARF and still has rave reviews and enthusiastic owners.

Telemaster was likely designed by Karl-Heinz Denzin, a well-known German model designer. The rights on the model had Alexander Engel, who produced it in his own factory and gave license to Jim Martin, owner of Hobby-Lobby. This story was told by Jim Martin himself in a [Mini Telemaster review](#). Later, the model was redesigned and produced by the well-known Joe Bridi. Today, Hobby-Lobby gets the kits and ARFs produced by [Aero Craft Ltd.](#).

Originally there were three sizes, the "standard" Telemaster, Senior Telemaster and Junior Telemaster. They had 1.8 m, 2.4 m, and 1.24 m wing span, nice round numbers in the metric system at least the first two, giving about 6 ft, 8 ft, and 4 ft in Imperial units. Today there are also a Mini and Micro Telemaster and even the 12 ft Giant Telemaster. The standard Telemaster 40 was often used as a trainer model, but maybe the typical version is the Senior Telemaster, likely because in the old times it was big compared to other models and even called a behemoth (in a 1973 article).



This has to be an old advertising picture; look at the transparent covering and the vintage transmitter. The lady is there to give an impression of the model's size.

Note the controls, set off by blue color. They are rather small; after all the model is from the reeds and early proportional R/C era. Note also the very lightweight construction.

»Senior Telemaster is so lightweight that we've found it flies beautifully with a .45 size engine.« What a surprise! But sarcasm aside, again there's some truth in this discovery. Recommended were .35 to .61 glow engines for a 2.5 to 5 kg / 5.5 to 11 lb all-up weight, meaning 9.5 to 19 oz/sqft wing loading. Maybe the designer kept the model just within the 10 ccm / 0.61 cin engine displacement limit and the 5 kg / 11 lb weight limit we had in Germany for all models. The plane was built sturdy enough to carry up to 5 lb payload, but the 1960s engines weren't that powerful. Today's engines are, so a .45 should be very well enough.

»With flaperons it nearly hovers into landings!« That's another modern thing. It may be even easier to drive each aileron with its own servo than to build the old bellcrank linkage. All but the cheapest transmitters have mixers to deflect both ailerons as flaps and superimpose the aileron deflections. It's true, the model really floats, but it's hard to control. Better build smaller ailerons and separate real flaps (see below).

What is so special about the Senior Telemaster? Well, I think its sheer size in the first place, because in the 1960s nearly all models were smaller than 6 ft. Even today when we have many really big models, these are all 3D aerobatic monsters or scale models but not simple utility airplanes. The big size and the low wing loading have some effect: »The Telemaster takes off like any trainer, but it seems to do it in slow motion.« says a [review](#), and I even find it flies almost majestically.

That "nothing flies like Senior Telemaster" just isn't quite true. All pilots of a Piper Cub model will know *similar* flight characteristics, at least if their Cub has low wing loading, because both airplanes have similar configuration and even the same airfoil. Due to the Senior's size even full-scale Piper Cub pilots should find it familiar, and each single-engine Cessna flies similarly as well (regarding only the main characteristics, of course).

Better forget aerobatics! Even though some simple aerobatics are possible, the calm and steady flight predestines the model as a trainer or as a utility model for all sorts of tasks. Especially aerial photos and videos come out in good quality without blur if heavy high-quality equipment is smoothly carried by the Senior Telemaster. You may simply drop a lot of candies as well or use the model as a glider tug.

Such a model appeals to pilots who are able to appreciate its abilities; it won't appeal to the average pilot who's searching for a thrill. The seasoned pilot, who has a task for the model, be it photographing or dropping or tugging, will appreciate the model's benefits. If the task is teaching to fly, he will even appreciate the model's flight characteristics as such and for his own enjoyment. An experienced model and full-scale pilot wrote in a [post in RC Groups](#): »To me, the unique thing about the Telemaster design is that I have never gotten bored with flying it.«

Sources

Credits are due to all those who published something about the Telemaster in the Web, may it be information, data, plans, pictures, or stories, or provided such things. Of course, you'll have to blame me for any errors, flaws, or misunderstandings.

Of course, there is Hobby-Lobby's [Web page](#) on the "original", glow-powered Senior Telemaster. [Aero Craft Ltd](#) currently produces Telemasters for Hobby-Lobby.

There are reviews in the E-Zone Web magazine sponsored by Hobby-Lobby, and to each review a RC Groups discussion thread is appended. There are reviews of the [Senior Telemaster ARF Electrified](#), the [6 Foot Telemaster Electro ARF](#) (with the discussion of Telemaster's trainer abilities), and the [Mini-Telemaster](#) (with Jim Martin's story).

Eric D. Wildermuth from Brisbane, Australia, kindly provided images of the Senior Telemaster plans scanned from the original October 1975 issue of the RC MODELER magazine. Thank you very much!

The RCM magazine still offers this building article and plan, though only for registered users and not free. The [direct link](#) or even the [construction articles page](#) aren't there any longer.

There's still a review of the original Senior Telemaster (the German version with D-tube wing and barn-door ailerons) from the April 1973 issue. Use the [direct link](#) or see near the bottom of the [Requested Reviews page](#).

Brad Nichols from the US contributed the plans for just that original Senior Telemaster, and the RCM plans, as well as a characterization of the design and an explanation why Joe Bridi modified it, based on his wide experience of building and flying Telemasters. Again, thank you very much!

Contributions

These contributions were involuntarily; I simply borrowed some hard-to-get components of the REFLEX model from other authors. At least they should be given credit here:

Bo (Jörgen) Strömberg from Sweden made a Veco engine for his excellent Graupner Taxi for REFLEX XTR. He published it on [RC-Sim](#) in August 2005 and later granted permission to use the engine model. Thank you very much! The engine is scaled to mimic a .45 on the Telemaster.

The glow engine sound was borrowed from *Thomas Hanser* who published it with his Westerly model on [RC-Sim](#). I don't know if he recorded the sound and from what model, and I think he will not mind that it's used for the Telemaster.

The payload variant has the sound of a JBA .56 ABC glow engine, just to be different. The sound was extracted from a video *David Vaught* presented in his [review on RC Groups](#).

The four-stroke variant has the sound of an RCV 91-CD rotating-sleeve engine. This sound is very similar to that of the 58-CD the power of which is assumed in the parameters. The characteristic sound was extracted from a video *Rich Noon* presented in his [review on RC Groups](#).

The electric motor parameters were taken from the [ModelMotors Web site](#). The motor was modeled using the drawing on this website, and the propeller was modeled after a real APC sport propeller. The drive parameters for REFLEX were calculated using [Drive Calculator](#).

The electric sound is borrowed from REFLEX, it's the generic electric sound of the pre-5.05 versions because I have no better one.

Shape and Appearance

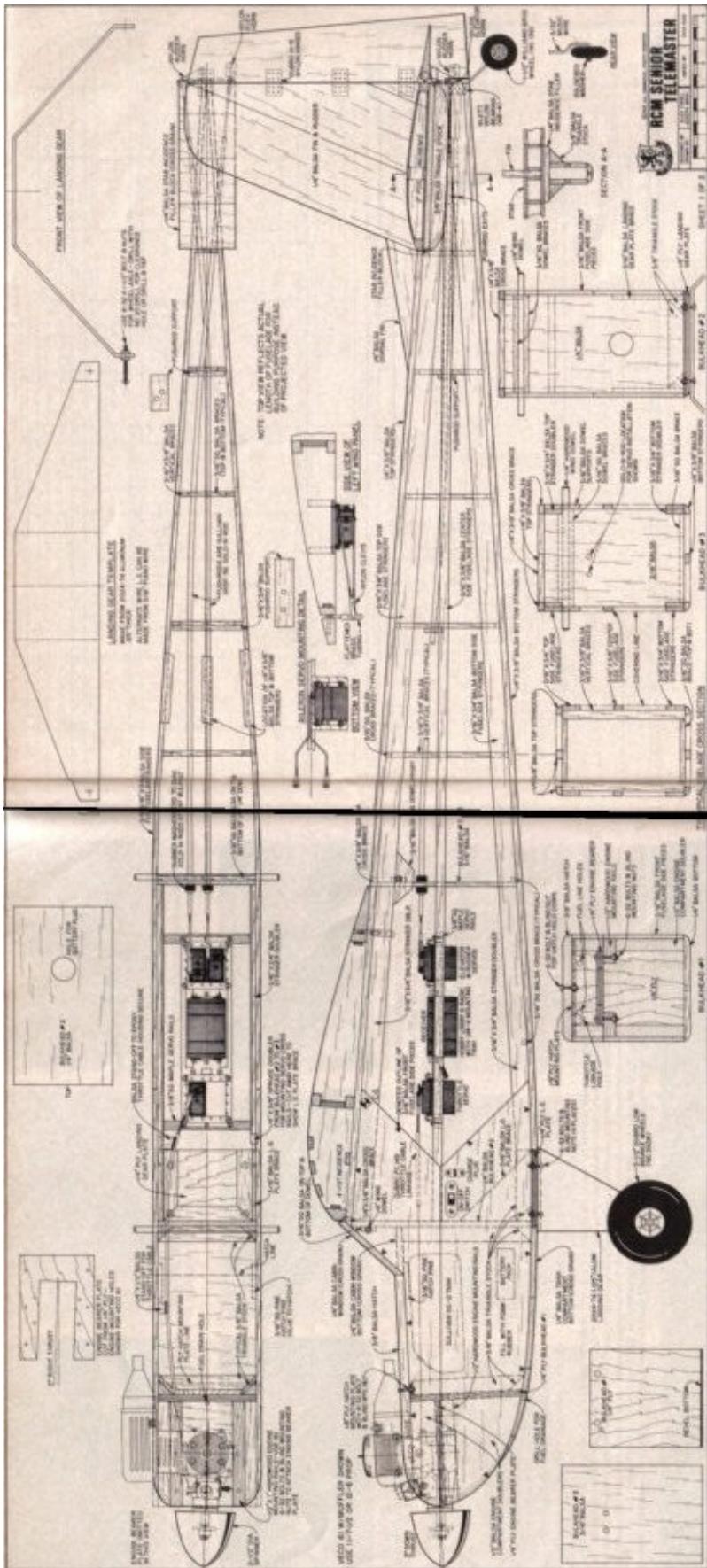
On the plans, the model looks quite boxy and almost ugly. In reality or in the simulator it isn't that ugly due to clever curvature and paint scheme.



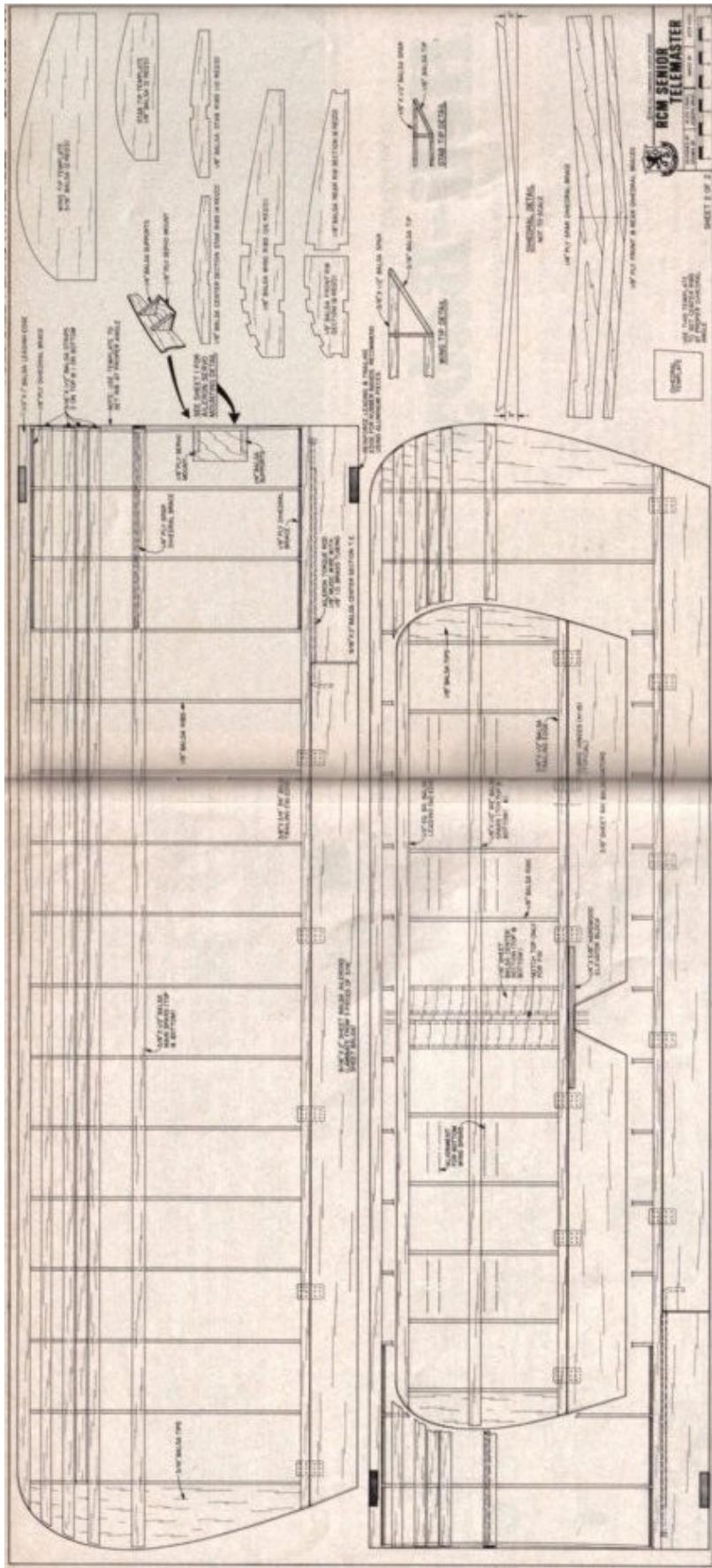
These pictures are borrowed from the [Hobby-Lobby web page](#) about the Senior Telemaster.

The fuselage is boxy, but it isn't a box. Instead, it's built up from longerons and bulkheads. Only the front part consists of slab sides and a balsa bottom. Seen from a side, this front part is nicely curved. Fin and rudder are plain slab balsa and are tapered and rounded for better look. Wings and horizontal tail are built up without sheeting or even a D-tube. Instead, there are several spars on the top front side of the wings, acting also as turbulators. The wing and stab tips are beveled giving a nice round tip without carving and sanding balsa blocks. There are simple strip ailerons and elevator.

The simulator model was built "on the plans" so it should be really true to the original. The plans in the RCM magazine are each spread over two pages. The halves were stitched together (using Panorama Tools) so that correct dimensions were achieved. You still see the fold or even a black gap in the following two plan sheets. There's also some crucial information in the plans.

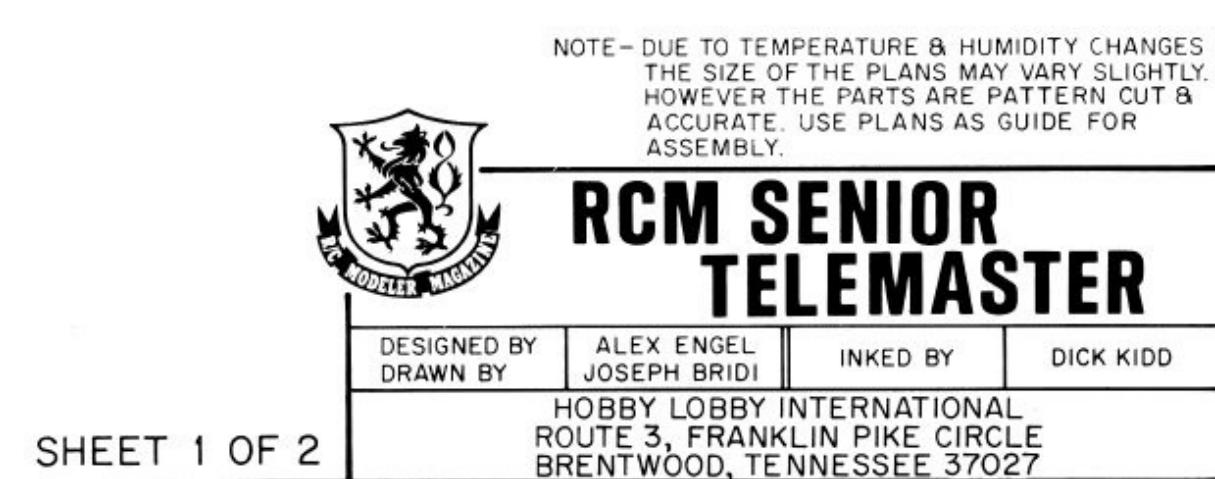


The fuselage sheet shows the airfoils of wing and horizontal tail. Additionally, the wing and stabilizer incidence angles are given as 4.5 and 2 degrees. Interesting are also the 12 oz tank and the 3½" wheels. The Veco .61 with muffler should have a 11x7½" or a 12x6" propeller with a 2½" spinner. The engine bearer plate is made for 3 degrees down thrust and 2 degrees right thrust. Note also the complete definition of the landing gear.



The wing sheet also shows the horizontal stabilizer drawn into the right wing. The rib templates were not needed for the REFLEX model as well as the braces. But the small front view shows the correct dihedral angle, though it is not to scale. The outer ribs simply have to be 3" higher than the center rib, giving 3.8 degrees.

By the way, the full-size plan shows one diagonal brace ("geodetic angle brace") in each wing rib bay for better torsional rigidity. Seems to be a good idea, but it's not known why they are missing in the article plan.



Each plan sheet's title block says:

Designed by Alex Engel
Drawn by Joseph Bridi
Inked by Dick Kidd

Remarkable is not that this plan was inked, after all CAD was not in common use in 1975. Remarkable is that Alexander Engel is called the designer even though he only had the rights of the design. Jim Martin told this in a [story about Alexander Engel](#) who was his friend and licensor for the Telemaster. Designer was Karl-Heinz Denzin, who was very well known in Germany for his excellent designs. Finally, remarkable is that the RCM plan was drawn by Joe Bridi who was a well-known, excellent designer himself.

In a [post on RC Universe](#), the Telemaster Story as told by Frank Schwartz is quoted. It seems that Joe Bridi somewhat simplified the design, especially the wing, for his kit produced for Hobby-Lobby. He replaced the sheeted D-tube by stringers and the barn-door ailerons by strip ailerons. Both strength and aileron effectiveness were reduced, but this design was retained from 1973 until today. It's not really known whether this redesign was done only for simplicity and lower cost or if there were other reasons.

Anyway, the REFLEX model was made to show not only the general outlines but also the ribs-and-spars structure of wing and horizontal tail. It would be even possible to render the internal structure and a transparent covering (as I did for my Brummi parkflyer), but that was simply too much work. Still you will see the wing covering sagging between the ribs and spars when you're viewing from certain angles. You'll have to keep some viewing distance, or the wing and tail will look a bit angular and awkward.



Adequate to this viewing distance, details were applied to the raw body of the model. These are control horns and linkages for rudder and elevator, mounting dowels and rubber bands for the wing (even with aluminum edge protectors), and the nose hatch with a fastening bolt. The antenna is hidden in the long fuselage, as well as the aileron bell cranks. I didn't bother about making control horns and linkages for flaps and separate ailerons. In the electric version, the wing dowels and rubber bands were replaced by Nylon bolts. The glow engines and the electric motor are detailed as much as possible. Of course, the landing gear, main and tail, is fully functional and detailed; the wheels are textured.



I didn't invent the Senior's paint scheme, I just borrowed it. No paint scheme shown in the advertisements and in the Web forums was really exciting, except one. It was only one picture in a RC Universe Web forum where a modeler presented his Senior Telemaster, but this one picture was enough.



In the first place, I adopted not only the outlines but also the blue colors. After a while I realized that especially the outlines and the color gradation are very well suited to the Telemaster. Now I simply varied the colors from blue to red and yellow. The two different colors in the scheme are actually the same hue but different saturation and lightness. Clever trick!

Depicted are here the three versions of the Senior Telemaster I made for REFLEX. The blue one has the O.S. MAX 60S-FR engine I made for my Kwik-Fli for REFLEX. It's a good replacement for the Veco .61 mentioned in the plan. The red version has Bo Strömberg's Veco engine, which was a small engine in reality, though. It was sized to mimic a .45 engine on this model. The RCV 58-CD of the red four-stroke variant was rendered using [review](#) pictures. The yellow version is the electric one with an AXI 4120 outrunner motor and an APC 14x10 Sport propeller I rendered after drawings.

Each version comes as at least two variants. The first is made as to the plans, featuring strip ailerons beginning at about 20% of a wing's span (shown in the blue version above). The other variant has shorter ailerons beginning at 50% span, and flaps from the fuselage to the ailerons (shown in the red version above). Of course, the different drives and wing configurations are reflected in the physical parameters.

Setup

As usual, I took the geometry from the plans and put it into Blaine Beron-Rawdon's excellent Plane Geometry spreadsheets (see the [overview](#) on his Web site) to get most of the physical parameters. The airfoil and wing coefficients were calculated in an own spreadsheet. All calculated values and several values from the plan were simply transferred to REFLEX. The model worked right away, so no tweaking or fudging was done.

Rendering a model like the Telemaster in a flight simulator is a case study. After all you won't do any kind of airwork in a simulator; the only purpose of the model would be enjoyment. For me, more than half of that is to understand how such great old designs actually work. And seeing how well the flight characteristics are rendered is part of the enjoyment as well though it's not my merit. Basically, it's all about correctness.

It should be self-evident that a model's geometry has to be correctly entered into the corresponding parameters. Some other parameters depend on the geometry, for instance damping or downwash coefficients. There are formulas to compute the values, some complicated and accurate and others simplified and giving only estimates. But anyway the physics model of the simulator is simplified as well, so the simple estimates are good enough.

Several parameters depend on several other parameters, especially the airfoil coefficients. Since the 5.01.xx versions of REFLEX they seem to be no longer airfoil coefficients but wing coefficients. That means you have to calculate the drag coefficients including the induced drag and the angles-of-attack (AOA) including induced AOA. They depend on the airplane's configuration, weight and speed, and there's no choice – just physics. The wing coefficients are calculated from the airfoil coefficients, and here's where guessing begins.

There are not many measurements of airfoil coefficients for the low Reynolds numbers models fly at. If there are measurements these are often lacking stall values or moment coefficients. There are programs to calculate the coefficients, but they are not reliable especially for the extremes like stall and for the moment coefficients. Unfortunately, just these values have a big effect on a model's flight characteristics, so we need sensible estimates.

Now let's look at the Telemaster. Its wing and horizontal tail both have a typical flat-bottom airfoil as used since the 1930s. Thickness is 13.2% for wing and 8.5% for tail. The most similar airfoil I have measured values for is Anderson SPICA. These values are reliable because they are well-tried for the Brummi parkflyer I own as a real model ([special page](#)) and for the Graupner Taxi that Bo Strömberg has. The coefficients for the effects of flaps and ailerons are not known but only best guesses though proven as well.

The C/G position was taken from the plan where it is depicted below the wing's main spar. The engine's right and down thrust were set exactly as

given in the plan (see above). Even the angles of incidence for wing and tail were taken from the plan and not from the calculations, but they had to be processed for REFLEX.

The angles in the plan are referred to the flat bottom, whereas the parameters are referred to the airfoil chord line. The differences were measured as 1.5 degrees for wing and 1 degree for stabilizer. While the zero-lift angle of the wing is reflected in the wing coefficients, REFLEX assumes a symmetrical stab airfoil. Thus, a zero-lift angle for the stabilizer airfoil was simply estimated using the thickness ratio and added to the incidence:

| | wing | stab |
|-----------------------|------|------|
| flat-bottom incidence | 4.5 | 2 |
| chord-to-flat-bottom | 1.5 | 1 |
| geometric incidence | 6 | 3 |
| zero-lift angle | -2.5 | -1.5 |
| aerodynamic incidence | 8.5 | 4.5 |

After several experiments it seems that REFLEX needs the aerodynamic incidences for both wing and stabilizer, not the geometric incidences. At least the model's behavior is quite reasonable if these incidences are set. Moreover, the much discussed effects of the stabilizer's cambered airfoil are all factored in. Both geometric and aerodynamic decalage are quite big (3 or 4 degrees) but typical for models like Telemaster. That indicates that they are flown at rather low speed, requiring big lift coefficients and angles-of-attack and thus the highly cambered airfoils. That is a flight regime where even the stabilizer contributes lift to help unburden the wing, and the cambered airfoil is just most effective in that case. It helps minimize the total induced drag of wing and stabilizer.

Control deflections were set in a pragmatic manner. Rudder deflection is limited to 30 degrees by the cutout of the elevator. I simply set also elevator deflection to this value. Another nice round number, 10 degrees, was tried for the ailerons, together with even 50% differential. No exponential rate was set. All these settings turned out to be adequate, though there is still considerable adverse yaw.

In the first place, the REFLEX model was made with three different drives, and each version with a variant. This was replacing the strip ailerons going from 20% to 95% wing span by shorter ones and separate flaps. The strip ailerons were set to act also as flaperons with 20 degrees deflection. The shorter ailerons going from 50% to 95% need 20 degrees deflection for the same effect. The (8% to 50%) flap deflection was set to 45 degrees for a good air brake effect. Only the low-powered model versions are limited to

35 degrees flap deflection because they lack the power to climb with flaps deployed 45 degrees. The variants with flaps are to demonstrate real STOL behavior.

The overall weight was set to 10 lb / 4.5 kg according to Hobby-Lobby's Web page. The moments-of-inertia were estimated correspondingly. Blaine Beron-Rawdon's method of relative-radius-of-inertia was applied with the values measured from my Brummi parkflyer because this is the most similar configuration I have values for. These values are the same for all versions and variants of the REFLEX model of the Senior Telemaster.

The parasitic drag of fuselage and landing gear is estimated quite reliably choosing rather big coefficients due to the engine and muffler and the boxy fuselage shape. The electric version has a lower drag, correspondingly, because the motor is hidden in the fuselage. The "Lift gradient of fuselage" value, influencing not only knife-edge flight but also sideslip, is only a wild guess - unfortunately.

An O.S. MAX 60F-SR with O.S. muffler was assumed as Senior Telemaster's engine. The drive settings in REFLEX are based on power and torque measurements published in an older German book. Static thrust with a 12x6" propeller was estimated using [ThrustHP Calculator](#). It was assumed that the engine might rev up to 18000 rpm what determines the decrease of thrust with speed in REFLEX. Fuel consumption would be 42 oz / 1.2 l per hour at any power setting, what was used to estimate the flight time.

In the "payload" variant of the .60 version, not only the thrust/weight ratio was reduced corresponding to the 5 lb / 2.3 kg payload. The model was "beefed up" to withstand the higher loads by increasing the maximum g-load to 12. Landing gear stiffness was increased as well. The 45 degrees maximum flap deflection was left unchanged for demonstration.

For the .45 version, I simply applied the 0.75 displacement ratio to all drive parameters in REFLEX. Only the longer flight time is estimated using real fuel consumption values of a .45 engine. For comparison, the two-stroke .45 was replaced by the RCV 58-CD four-stroke with a 12x6" propeller. The parameters were estimated, as well as those of the .20 version, which was made because Frank Schwartz in the [post on RC Universe](#) mentioned a .19 version.

For the electric version, the drive parameters for REFLEX were calculated using [Drive Calculator](#). An AXI 4120/18 outrunner motor, an APC 14x10 Electric propeller, and a 5000 mAh 5s1p LiPo battery would weigh about as much as the glow engine drive (35 oz / 990 g). The 0.6 thrust/weight ratio is quite good for this model. Flight time was estimated from the 5.6 minutes full-power runtime assuming that full power is rarely needed and much less power is required for cruise flight. By the way, a 2300 mAh 6s2p A123 battery would have the same voltage, slightly less capacity (4600 mAh) and slightly more weight (8 oz / 225 g) than the LiPo battery.

A 6000 mAh 4s battery would reduce the thrust/weight ratio to 0.44, what is still quite sufficient for most practical purposes, but nearly double flight time. But the maximum flap deflection is reduced to 35 degrees in this "duration" variant so go-around and climb are possible with full flaps. The drive parameters are adapted to the lower battery voltage.

Flight Characteristics

Senior Telemaster is a remarkably smooth and steady flying utility airplane, but it's a model for the connoisseur. Many model pilots may be bored or even annoyed.

Some are bothered by the fact that substantial rudder is needed with ailerons. That might start off learning to fly coordinated turns (there is no harm in trying). After all, such behavior is unavoidable with the highly cambered airfoils used for the wing. The adverse yaw is even quite small compared to that of other models, even though Senior Telemaster has slender ailerons, because it's set up with only 10 degrees maximum deflection but even 50% differential.

Just for that the next complaint will be that the ailerons are not effective. But they are just as effective as rudder and elevator, and as needed. It's an unfair complaint because the model will of course somewhat refuse to turn if adverse yaw is not canceled out by rudder. So at least arm the combi switch (or whatever it is named) on your transmitter to give the same amount (in %) of rudder deflection as aileron throw and you'll be surprised.

Rudder against adverse yaw will be even badly needed if the ailerons are deployed as flaperons. Because aileron throw is superposed to flap deflection, severe adverse yaw is unavoidable and aileron effect is really poor. This nasty behavior isn't made up for by the small improvement in landing behavior. Flaperons might be better than nothing if the model was built with the strip ailerons, but it's easy to replace them by smaller ones and separate flaps even later.

The strip aileron chord length is retained for both ailerons and flaps without much loss of effectiveness. The shorter ailerons need twice the deflection, but without noticeable additional adverse yaw, and they stay effective when flaps are deployed. No tip stall will occur even with full aileron.

The effect of flaps (as well as flaperons) is to slow down the model and to make for a nose-high attitude when some engine power is set. Increased lift is not important because the big wing and the highly cambered airfoil are good for more than enough lift and because the lift increase is quite small, anyway. More important is much drag increase because that enables you to select an arbitrarily steep glide path. That's why maximum flap deflection was set to 45 degrees for the flap variants.

But beware of inexperienced pilots on the sticks! In the weaker .45 glow engine version, maximum flap deflection is only 35 degrees to make that life-saving go-around maneuver possible. Reducing deflection from 45 to 35 degrees reduces drag but not lift, and this modification was done to the full-scale single-engine aircraft because there are many inexperienced pilots. The strong glow and electric Senior Telemaster versions are so well powered that they even climb with flaps 45 degrees down, and even with some payload.

But with flaps down, it's not possible to land the model smoothly without substantial power. Even if you have to land in a confined area and need to steeply approach the model with idling engine, you will have to apply a short but decent push of throttle to round-out the approach and bring the model from the extreme nose-down attitude to the nose-up attitude for touch-down. It needs some experience to do that in the right amount and in a coordinated manner.

The normal and less spectacular landing procedure with full flaps is to adjust a reasonably flat approach path so the change in attitude for touch-down is small. Telemaster is trimmed so that only throttle is needed for that and elevator only to correct for gusts etc. Bear in mind that changes in attitude and especially touch-down require moving the elevator and throttle stick coordinated in the same direction, maybe the elevator slightly leading the throttle. It will need substantial power to fight the high drag and flatten the approach, but it will still need substantial elevator to flare. If you have the airplane in three-point attitude and ready for touch-down, cutting power will let it really plop down and the roll distance will be very short.

With flaps (and even flaperons), Telemaster is a real STOL airplane (STOL = Short Take-Off and Landing), but STOL airplanes are for experts only. For dropping candies or R/C skydivers or for glider towing, you can make good use of high engine power and big flaps drag for a fast up and down. If you are an expert making such use of the model, build it with a powerful engine and with flaps. If the model is used as a trainer, both are really not needed and may be even detrimental.

You will as well appreciate a powerful engine and the flaps if you're using the model to just carry much load, for instance video or measuring equipment. It will fly noticeably faster and will need noticeably more space for landing. The ".60 glow flaps payload" variant will show that. Take-off and climb are still really good, and even landing isn't hard at all (actually it's easier). But with the heavy 5 lb payload (50% of net weight) a go-around maneuver will require the flaps be reduced to 35 degrees or the model will barely float but won't climb. As an expert, you would still appreciate the 45 degrees deflection for steep approaches and short landings and just carefully reduce flaps in case of a go-around.

The .45 glow engine version has just as much power as is needed for vivid normal flying without payload. That is the version I would recommend for a

beginner. Still I would prefer the flaps version, which is limited to 35 degrees deflection to enable a go-around to be done without touching the flaps lever. A rank beginner just shouldn't touch it at all and learn to land the model without flaps. Later he can find out the effects of flaps including the easier take-off with 10 or 15 degrees deflection.

Anyway I can imagine the Senior Telemaster in the hands of a beginner only with an instructor on the buddy box. The model is likely to be owned by the instructor and used because of its "slow motion" behavior and good overall characteristics. That way some things are demonstrated to the beginner he otherwise wouldn't recognize as soon and easy. Following the review of the [6 Foot Telemaster Electro ARF](#) is a very interesting discussion of the model's trainer abilities, worth reading the three first pages of posts. Not many people there write about a beginner alone with the model.

Telemaster is built like a free-flight model, but it isn't exactly set up like one. The simple structure makes for low weight but reasonable strength. The big wing and horizontal tail, both with cambered high-lift airfoils, and the low wing loading make for slow flight. Unlike a free-flight model, Telemaster has controls, but small ones as customary in the early R/C era when proportional control was not yet in common use (and servoes were weak and unprecise). Still it is a "full-house ship" with all the controls a full-size airplane has. And even though it is a shoulder-winger with substantial dihedral (3.8 degrees) it doesn't fly on its own.

Like a beginner model of the 1960s, it may be even flown with rudder and throttle only, but it has to be flown and it's hard. Due to the moderate dihedral and decalage, there's only moderate influence on the model and it won't return to straight and level flight without help. On the contrary, it will remain in the current attitude and state, what is intended behavior for a utility airplane. You may set it on a straight or a circle course and will have to make only few small corrections, but you won't leave it alone. A rank beginner needs a model that flies on its own, so after he has upset it he may just leave it alone until it has calmed down. You might compare [my essay on the VEBF](#), a real 1960s beginner model.

Just to see how it works, the Senior was equipped with an old 1970s O.S. MAX .20 with a 9x4.75 propeller, similar to the VEBF. Of course, this is not a rocket version, but it flies off paved runways and, with 10 degrees flaps or some down elevator to lift the tail, even from short grass. Once in the air, the model has all the power it needs for normal flying and lets the other versions seem overpowered. A modern .20 or even .15 would have the right amount of power to give a very "scale-like" flying, like a full-size vintage airplane. It's not for airwork or for beginners, but might be a duration flyer.

All the flight characteristics mentioned above can be seen in REFLEX. That means the parameters found by just measuring and calculation or taken from the plans are well suited. REFLEX faithfully renders the model's flight

behavior, even though there have to be a few simplifications as in any simulator. In this case, only one issue comes into mind.

Oddly, you have to apply left rudder during the ground roll. Once the model is in the air it flies straight on its own. Obviously, REFLEX renders some of the effects of propeller torque but not all of them. At least one effect is not part of the flight physics model. I think it's not the obscure P-factor or the gyro effect. The former is effective at high angle-of-attack (AOA) and at some speed, but here the left twist exists also when the model is level and slow. The latter is effective only at the moment when AOA changes.

In reality, there's a strong propeller slipstream. Often people explain that it spins around the fuselage and hits the vertical tail from only one side, pushing it to the other and so yawing the airplane. Because engines turn right-handed so does the slipstream and hits the tail from the left pushing it to the right. Even though this effect undoubtedly exists but is not rendered in REFLEX, I prefer another way to explain the observed behavior.

The spinning slipstream is itself a gyro. It has to pass the wing, which produces the lift to carry the airplane. The lifting wing deflects the slipstream down what makes it bend clockwise (seen from above), and that *action* gives - as a *re-action* - the left-yawing tendency that is not rendered in REFLEX (as any gyro effect). The effect would be greatest when the propeller is working with maximum torque and the wing with maximum lift coefficient, so during ground roll for take-off. In REFLEX it isn't there. We see a right-tendency caused by the engine right thrust, which is gone when the model is in the air because then the right thrust compensates the torque effects.

History

Very little of the Telemaster history is actually known, at least to me, but here it is for those who care about it: The only fact never doubted is that all started with Alexander Engel in Germany producing the Telemasters in his own factory. That Karl-Heinz Denzin was the designer is challenged by Frank Schwartz, who worked for Hobby Lobby and reports in his [Telemaster Story](#):

» Engel never told me who the original designer of the plane was. He did not design it and there apparently was some controversy over the true designer as he related to me that a number of people in Germany claimed to have been the designer. Notwithstanding, Engel had the exclusive rights and continued to produce them well into the seventies. «

But Jim Martin in the [Mini Telemaster review](#) clearly states: » Alex did not design them: Karl-Heinz Denzin did as an employee of Engel's. But Alex owned the name and the design. «

And a Denzin biography, written by a member of the German vintage model society (who interviewed Denzin) and published in a [German Web magazine](#) in 2007, tells that K.-H. Denzin worked for A. Engel in 1967 and 1968 and the "Telemaster (Junior and Senior)" was the result.

That also sheds some light on the time of creation. While Jim Martin just guesses it was in the early 1960s, the biography explicitly specifies 1967/68. That is supported by the fact that the 1967 Engel catalog offers some older, big utility models but doesn't show any Telemaster. On the other hand, the 1973 Engel catalog has a whole page for the three Telemaster variants (see below). Strange enough, it lists the Junior, standard, and Senior Telemaster in that order, but mentions K.-H. Denzin as the designer only in the middle, for the standard Telemaster.

It may be interesting to look at the description of the models, written by the original manufacturer (my translation of the catalog page shown below):

» The 3 Telemasters «

» well-engineered designs by experts for ambitious R/C pilots and as well for those who still wish to be, and moreover not only in Germany but also in the USA and many more countries, the far and away best-selling models in our product line. Guess why? «

Continued on the page after next...

RC-MOTORFLUGMODELLE



Die 3 Telemaster

ausgereifte Konstruktionen von Könnern für anspruchsvolle RC-Piloten und auch solche, die es noch werden wollen und außerdem nicht nur in Deutschland, sondern auch in den USA und vielen anderen Ländern, die bei weitem verkaufserfolgreichsten Modelle aus unserem Gesamtprogramm. Warum wohl?



Nr. 1391 J JUNIOR-TELEMASTER, 2-Achs-RC-Trainer, 1240 mm Spannweite, für Motoren von 1,5–3,5 ccm.
Wer noch kein RC-Modell gesteuert hat, sollte mit dem Junior anfangen.
Er nimmt so leicht nichts übel und ist ein idealer Trainingspartner.

Nr. 1391 A TELEMASTER, Mehrachs-RC-Motormodell von K. H. Denzin, Spannweite 1800 mm, Länge 1200 mm,
Zuladung über 2 kg, für Motoren von 5–10 ccm. Vielseitig einsetzbar, auch für Segelmodell-Schlepp.

Nr. 1391 B SENIOR-TELEMASTER, Groß-Modell mit 2400 mm Spannweite, für Motoren von 6–10 ccm.
Schnellbaukasten mit ca. 2,5 qm Engel Nylon Bespannung.

Telemaster und Telemaster-Senior wurden für Liebhaber großer Flugmodelle entwickelt und ermöglichen auf Grund ihrer großen Eigenstabilität und gutmütigen Flugeigenschaften den direkten Übergang von Freiflug-Sportmodellen zum Mehrkanal-Fernlenkflug. Sämtliche Ruder und Motordrossel sind im Plan vorgesehen. Falls aus irgendeinem Grund auf die Betätigung der Querruder verzichtet wird, ist zur Sicherung einer ausreichenden Querstabilität die V-Form von 50 auf 100 mm zu vergrößern.

Telemaster und Telemaster-Senior eignen sich auf Grund ihrer stark tragenden Flächenprofile sehr gut für Sonderaufgaben wie Bannerschlepp, Flugblatt- und Fallschirmabwurf, Luftfotografie usw., sind jedoch nur für einfachere Kunstflugfiguren geeignet.

Der JUNIOR-TELEMASTER wurde aus dem Großmodell TELEMASTER entwickelt. Er ist speziell für die Freunde eines gutmütigen Zwei-Achs gesteuerten Modells vorgesehen. Auf die Querruder wurde bewußt verzichtet. Ein nachträglicher Einbau ist ohne weiteres nach eigenem Ermessen möglich. Alle 3 Telemaster können bereits mit preiswerten Kleinfernsteuer-Anlagen – wie unsere Bellstar 2/1 oder 2/2 – sicher gesteuert werden.

- » **JUNIOR-TELEMASTER**, R/E R/C trainer, 49 in wing span, for .15 to .20 engines. Who never flew an R/C model before should start with the Junior. He doesn't mind much and is a perfect training partner. «
- » **TELEMASTER**, powered multi R/C model by K.-H. Denzin, 71 in wing span, 47 in length, more than 70 oz payload, for .30 to .61 engines. Suited for a variety of tasks, including model glider tow. «
- » **SENIOR-TELEMASTER**, giant model with 94 in wing span, for .35 to .61 engines. Quick-assembly kit including about 27 sqft Nylon covering fabric. «
- » Telemaster and Telemaster-Senior were developed for the fans of big model airplanes, and due to their high inherent stability and docile flight characteristics they facilitate proceeding directly from free-flight sport models to multi R/C flying. Provision is made in the plans for all controls and throttle. If for some reason the ailerons are not used, the dihedral should be increased from 2 to 4 inches to provide sufficient lateral stability. «
- » Due to their high-lift airfoils, Telemaster and Telemaster-Senior are very well suited for special tasks like banner tow, leaflet or parachute dropping, aerial photography, etc., but they are suited only for rather simple aerobatics. «
- » The JUNIOR-TELEMASTER was derived from the giant model TELEMASTER. It is designed especially for the fans of docile rudder/elevator models. Ailerons were intentionally omitted. It is well possible to install them later offhand and as one sees fit. All 3 Telemasters may be safely controlled even with inexpensive small R/C gear - like our Bellstar 2/1 or 2/2. «

Seems there's nothing to object. No mere advertizing, all in all a remarkably factual and correct description, proven by 35 years of customer satisfaction. The model just really hit the mark. So what happened next?

1973 was the year when the Senior Telemaster was brought to public attention in the USA by the [April 1973 RCM original Senior Telemaster article](#) initiated by Jim Martin, owner of Hobby Lobby. Obviously, they imported the kits produced by Engel in Germany, but not for long, as [Frank Schwartz](#) reports:

» Engel finally quit producing them but the demand was still there. He gave the rights to Jim Martin of Hobby Lobby (I was sales and advertising manager there at that time) and Jim had Joe Bridi make the kit for him...plus the plans for the US version also appeared in RC Modeler magazine. «

That was in October 1975, only two and a half years later. No reason is mentioned anywhere why Engel ceased production. The [Engel company history web page](#) even tells that in 1977 Engel established a new model airplane production in England, named *Balsacraft*. But there's no other mention of "the far and away best-selling models in our product line". Strange enough in this context is another remark by [Frank Schwartz](#):

» Later, Hobby Lobby gave the rights to produce the planes to a company in England and they produced some variations of the plane. «

Anyway, all sources agree that the Telemaster quickly became famous. One indication of that is a story told over and over again, even though nobody knows where it came from and if it is actually true. The story as told by [Frank Schwartz](#), quoted 2007:

» The Telemaster became famous in Europe as one of the original planes was used to carry a line across a chasm for building a bridge. First a small line was carried across and once done, larger and larger lines were pulled across. This is the claim to fame for the Sr. Telemaster. Probably the first industrial use for a model airplane. «

But the story existed much earlier as it is told already in the [April 1973 RCM original Senior Telemaster article](#):

» This aircraft design has been around for a number of years in Germany, and has been used to string telephone lines across deep ravines, which task would otherwise require the use of a full-size helicopter. «

Funnily, or maybe strangely, enough, the Denzin biography in the [German Web magazine](#) has the same story "the other way around". Without mentioning a source, (in 2007) the article tells about the Telemaster:

» This model is - as far as is known - the first workhorse of the air and was rigged for banner and glider tow, photography, as well as candy or skydiver dropping. In the USA, the model even became famous because it helped running a power line across a chasm and saved hefty helicopter expenses. «

If that were a true story, I think A. Engel / K.-H. Denzin as well as Jim Martin / Joe Bridi would have properly used it for advertising. But they just didn't mention it, as far as I know, so I think it's only a rumor. I don't think they put out that rumor, either. Maybe Jim Martin passed it down to RCM, but for me it's still a typical *urban legend* or *folklore*, or, since its origin and originator are unknown, a *FOAF (friend of a friend) tale*. Even if it's probably not true, it yet could be and it certainly speaks for Telemaster and its qualities.

Yet there was some grumbling about Joe Bridi's redesign, especially the wing, which was weak compared to the very sturdy original wing and had less effective strip ailerons instead of the original barn doors. Again, [Frank Schwartz](#) put it into clear words:

» There is a puzzle here as Bridi "redesigned" the plane somewhat. The outlines and plan form remained the same, but he used aluminum sheet gear in some of the kits and also had a steerable tail wheel. The main deviation was the wing. Whether Bridi didn't want to use as much 3/32 by 4 by 48 inch balsa sheet or he thought his idea was better, will never be known. Nonetheless, Bridi's version of the Senior Telemaster (as it remains today), featured strip ailerons and stringers on the top and bottom of the wings rather than the sturdy sheeting. The first batch of Sr. Telemaster kits by Bridi for Hobby Lobby were falling out of the sky right and left due to weak light ply dihedral braces and the very construction of the wing itself. The remedy was to add more braces which was done and this seemed to solve the problem. «

» The barn door ailerons on the original were much more effective than the strip ailerons but Hobby Lobby and Bridi persisted in using strip ailerons, even to this day. «

» I have the plans for the original wing and if one is building the Senior Telemaster, he should build the fuselage and tail group according to the “new” plans, use wire landing gear and get a copy of my original German wing plans and he will have a better flying and responding plane...my humble opinion, of course. «

Indeed it is rather puzzling to compare the two RCM articles. The [April 1973 RCM original Senior Telemaster article](#) sounds quite honestly enthusiastic:

» The kit, itself, consisted of some of the finest quality balsa wood that we have seen to date. The structure is utter simplicity, and virtually any modeler could follow the construction sequence even without English instructions. The fuselage is of the lightest weight design we have seen, using excellent engineering techniques to achieve maximum strength and durability at a minimum of weight «

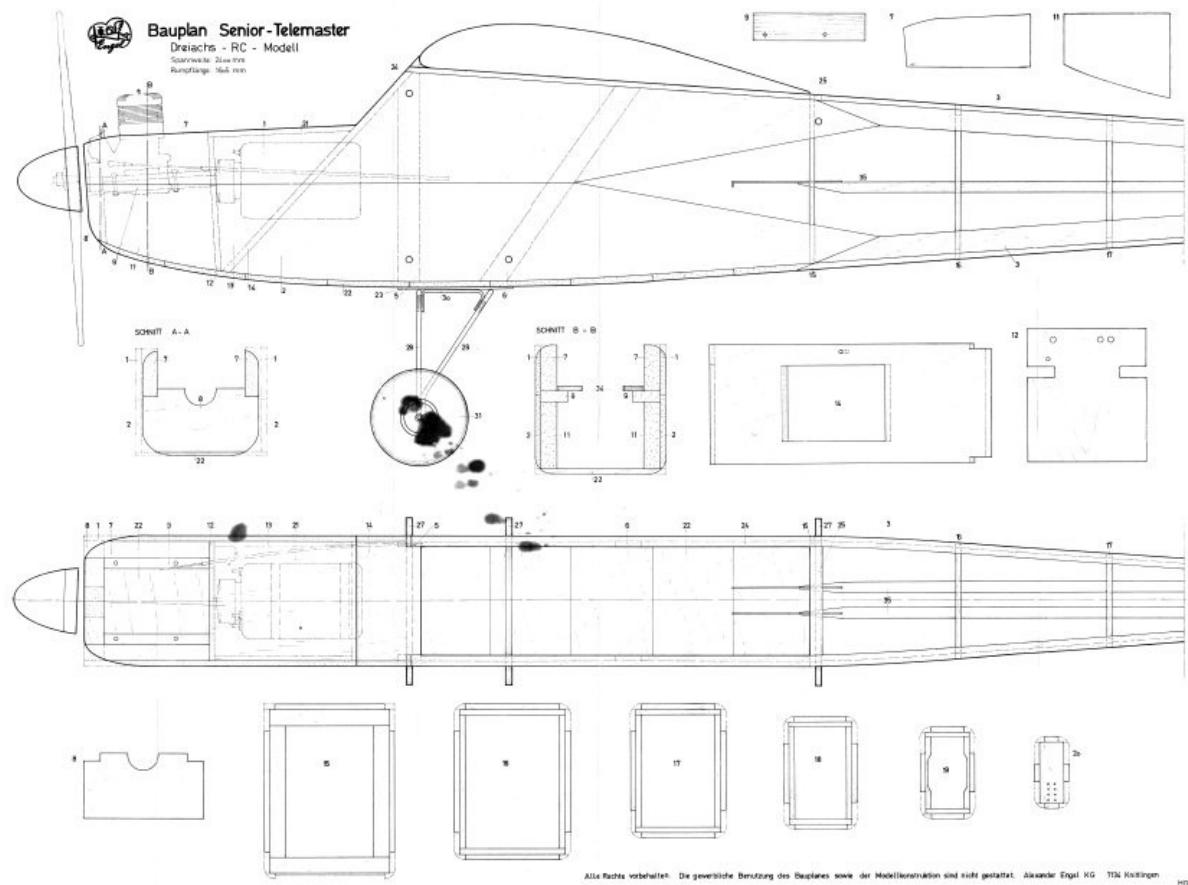
Two and a half years later, in October 1975, they had to boost the new version. How should they explain the redesign to the fans of the original Telemaster? So they presumed to sell it as an improvement all along the line:

» A few minor modifications have been made to improve the structural integrity of the model, although little could be done to improve the outstanding flying characteristics of this magnificent aircraft. «

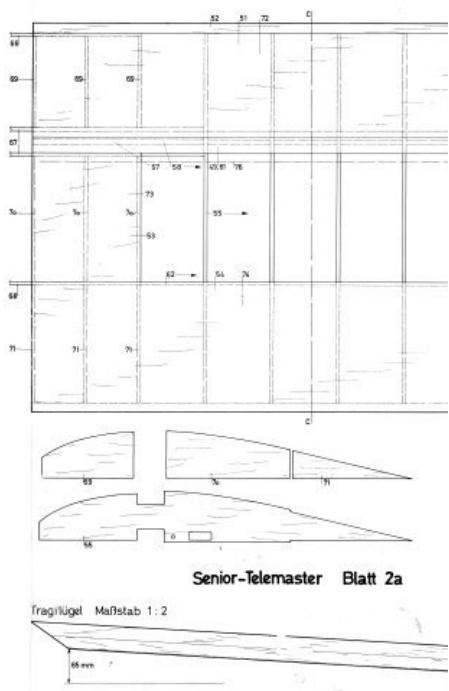
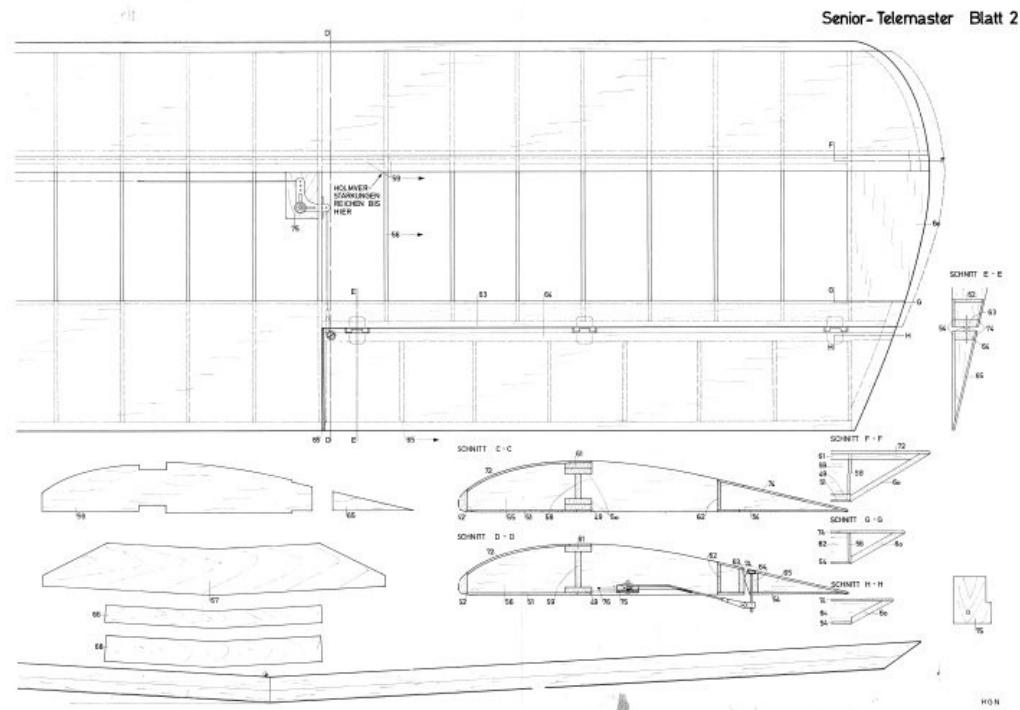
» While the new version of the Sr. Telemaster looks like the original machine once kitted in Germany, the new one boasts some design changes. The changes were made both to simplify the construction and to offer a stronger airframe. The barn door ailerons have been changed to strip ailerons. They're easier to build and set up and they offer a stronger wing trailing edge. Heavy spars, full length 1/2" x 3/16" strips running along the front of the wing, a 1/4" ply spar dihedral brace coupled with a 1/8" ply leading and trailing edge dihedral braces add up to a wing that's almost strong enough to make a diving board for the local swimming hole! A dorsal fin has been added to the vertical fin for strength. The stabilizer has been re-designed to make it more twist resistant and the fuselage construction has been changed to make the building easier and the airframe stronger. «

Some remarkable discrepancies between the two articles, don't you think? I suggest you take for granted what [Frank Schwartz](#) reported and compare the stabilizers yourself. Let me add that the new version was even 9 oz heavier than the original one, both as built and specified by RCM. To me it seems the first article was true and what the second article purports is just the opposite of what really resulted from the redesign. Oh well, at least it were different authors. And we know how to read model airplane reviews after all, don't we? I may sound like being gutted, but see yourself.

First look at the original (German) plans as kindly provided by Brad Nichols. Notice some sophisticated fuselage details typical for K.-H. Denzin, and the simple and lightweight structure:

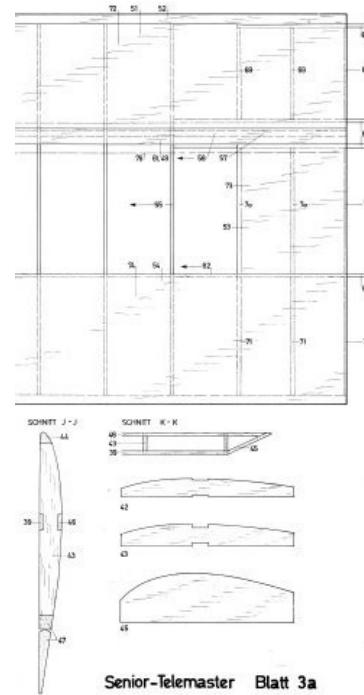
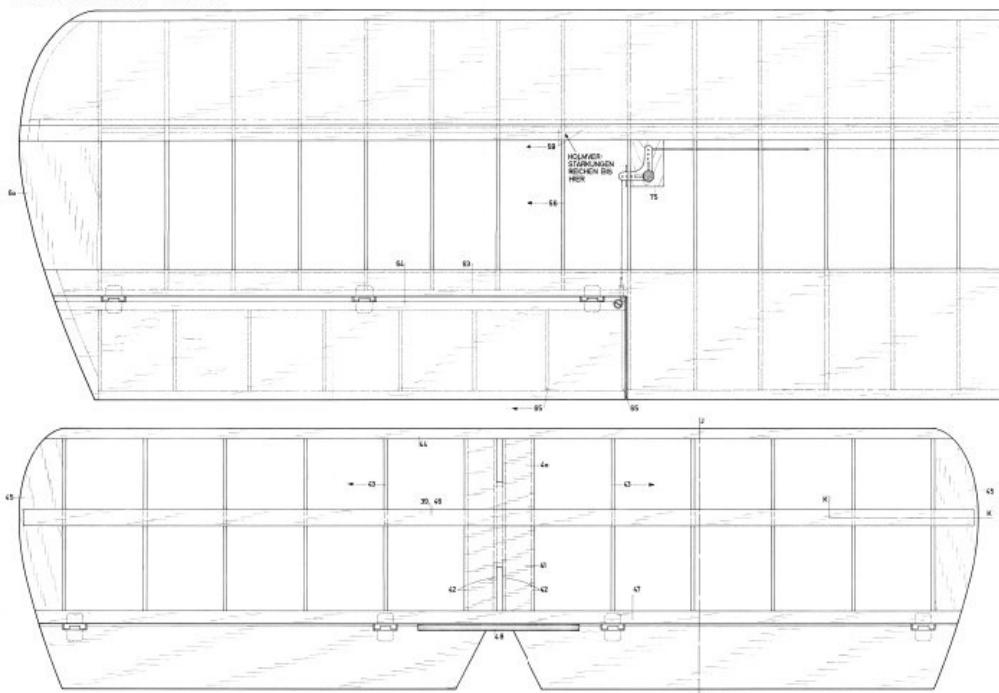


That's the incriminated wing structure. Notice the double D-tube sheeting for ultimate torsional rigidity. For ultimate strength, there's an I-beam main spar with doubled bars out to the ailerons and solid dihedral braces. This design is not really typical for K.-H. Denzin but is a common heavy-duty design used for slender glider wings, for aerobats, or just for load-carrying models.



The left wing is shown here for completeness and doesn't add anything new. Just notice the small rib spacing and the absence of cap strips. The barn-door ailerons have three (pin) hinges and require a bellcrank linkage. Nothing special on the stabilizer.

Senior-Telernaster Blatt 3



At first glance, there seems to be nothing wrong with this design. On the contrary, for me it is a shining example of a simple and most efficient concept, carefully designed with much attention to detail - just very well-engineered without compromises. I needed Brad Nichols' help to see the downside, the expenses in building material and time:

» You will find out very quickly why Joe Bridi made the modifications he did. The original plane would have required balsa sheeting for the leading edge that was far wider than would have been available at the time. Plus the design resembles an older style of building from the late free flight days or very early R/C days. It features rib spacing about 50mm apart, about 1/3rd more ribs than necessary. It also featured landing gear that was rubber banded on. The Bridi rendition of the plane is far simpler to build and uses fewer materials, is probably lighter, and for the most part is true to outline of the original design. «

Agreed, K.-H. Denzin had his experiences and his own style, even if I don't think he was biased by the free-flight designs. He just chose the best solution in each case, that is one that he knew of, and accepted a bit more cost, still keeping them low. To me it seems he just didn't compromise the main design goal to have a perfect load-carrying airplane. His other designs had substantially wider rib spacing, so this one should have been chosen for a reason, maybe to prevent the flat-bottom sheeting from buckling. And Bridi made each wing have 16 ribs instead of 20, that's just 20% saving.

» There is a happy medium that can be reached with a re-design to bring the structure up to a more modern and simpler build. The Telemaster 40 is just that, only a little smaller. On the Telemaster 40 the wing is sheeted top and bottom to the thickest part of the chord of the wing covering only half the distance of the spar. The trailing edge is also sheeted but only about 30mm or so. Cap strips 10mm wide attach to the aft half portion of the spar and make for a clean surface from sheeting to sheeting. This allows you to space the ribs closer to 80mm apart without the covering material sagging between them. «

That is indeed a very acceptable compromise because it reduces costs without spoiling the function. Undoubtedly there are solutions other than those chosen by K.-H. Denzin. Still I think you would compromise function, and the original design isn't that expensive, either.

» Putting the stringers across the top leading edge of the wing on the Senior Telemaster was a terrific way to keep the covering from sagging in between the ribs without having to come up with extra wide sheeting material. It does less damage to the shape than sagging material would, and it simplified construction. «

Yes, if you aim at avoiding the many ribs and the sheeting material. I think that might have been no problem for Engel, though. He had his own factory and made not only models but also cut balsa sheets and bars. I remember 1.0 x 0.1 m sheets of various thickness being standard, but there were also special 1.2 x 0.1 m sheets available, even if a bit more expensive. To me the 2.4 m wing span even seems to be especially chosen with respect to this sheet size. And I guess Joe Bridi had not the same balsa supply as Engel.

I might even perceive that "heavy spars" in the 1975 article as heavy balsa quality. He just found a smart solution for his problem, but neglecting the original main design goal.

» Back in those days it was probably a good idea to make the plane so that it would come apart instead of breaking on impact. Most people put in a plywood plate and bolt the gear to that now. It's a good simple reliable design. «

Again yes, K.-H. Denzin was used to the rubber-band and dowel mount for wing and landing gear, but on closer inspection he utilized it to get a rather filigree and lightweight fuselage, not only to prevent damage on impact. I know his rudder-only designs, they are very sturdy to withstand the impact just unavoidable there. Telemaster, on the other hand, was designed as a full-house ship in the first place, filigree for low empty weight but still sturdy to carry huge loads.

Please note that I don't want to argue with Brad Nichols. I really appreciate his help in understanding Joe Bridi's intentions and design decisions. It's just that I'm playing not devil's, but the original designer's advocate, probably because I'm feeling nearer to him. I'm not able to give Brad's explanations, so his contributions are essential to shed light on all aspects of the topic.

Joe Bridi's redesign looks like an early, quite successful example of value engineering. He achieved the intended savings without rendering the model useless. Obviously, his solution worked quite well, at least after adding more dihedral braces to prevent wing fracture. His version is even a bit heavier (comparing the weights specified in the two RCM articles, 95 oz / 2.7 kg in 1973 and 104 oz / 2.95 kg in 1975) but still safe to fly as long as it doesn't carry heavy payload, in which case the owner could, and should beef it up as one sees fit. That's why there are those forum threads like [The Birth of a Heavy Duty Senior Telemaster](#), in which Frank Schwartz was quoted.

My main concern with this design is indeed the wing, which seems not strong enough to be up to the model's "aerodynamic" load-carrying ability. So using the model is limited to an extent not predictable for the owner. With the original design, he could just rely on the model being sturdy enough to bear all possible loads. All he can rely upon with the new design is it being strong enough to bear its own weight. Add any load and it's all up to you.

The main spar may be strong enough, but for me it doesn't look so. There are only a few shear webs and they are ridiculously weak. The original shear webs are not much heavier but much more effective. The original shear webs and sheetings gave even two closed "tubes" for enough torsional rigidity to withstand the big airfoil moment. Fortunately, this torque makes for down-pitch so the non-rigid new wing just develops some washout under load. It's indicative that the full-size RCM plan (below) and the ad picture (page 1) show "geodetic angle braces" in the rib bays to enhance torsional rigidity, and I wonder why they are not shown in the small RCM article plan (above).

The original design just already was a heavy-duty Senior Telemaster, no need to create one. But while I'm still bothered by the wing structure, I can even accept the strip ailerons.

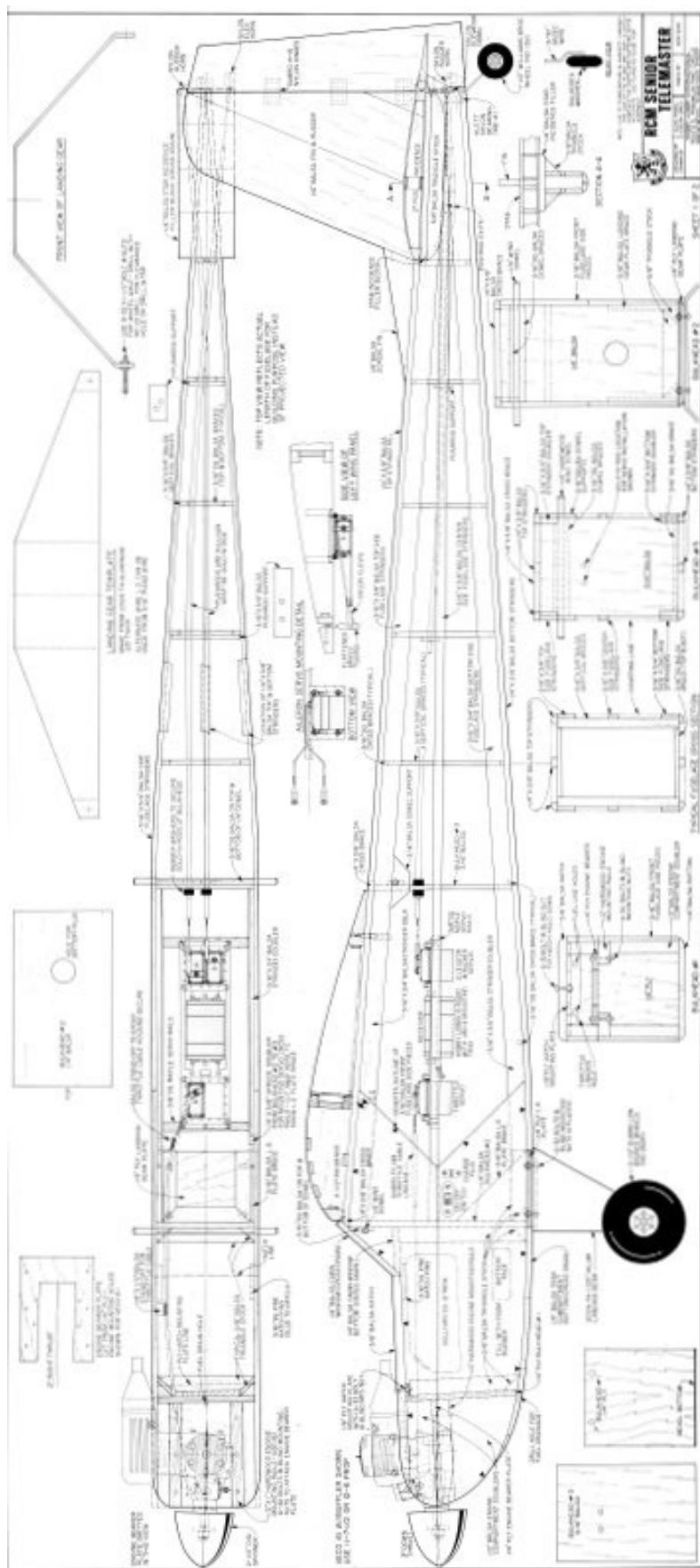
What I can hardly stand, though, is the humorous tone in the introduction of the 1975 article, because - knowing what I know now - to me it sounds like spoofing. So I dare to take the paragraphs quoted above and intersperse some scathing annotations, reminiscent of Jef Raskin's great essay [How To Read a Model Plane Review](#):

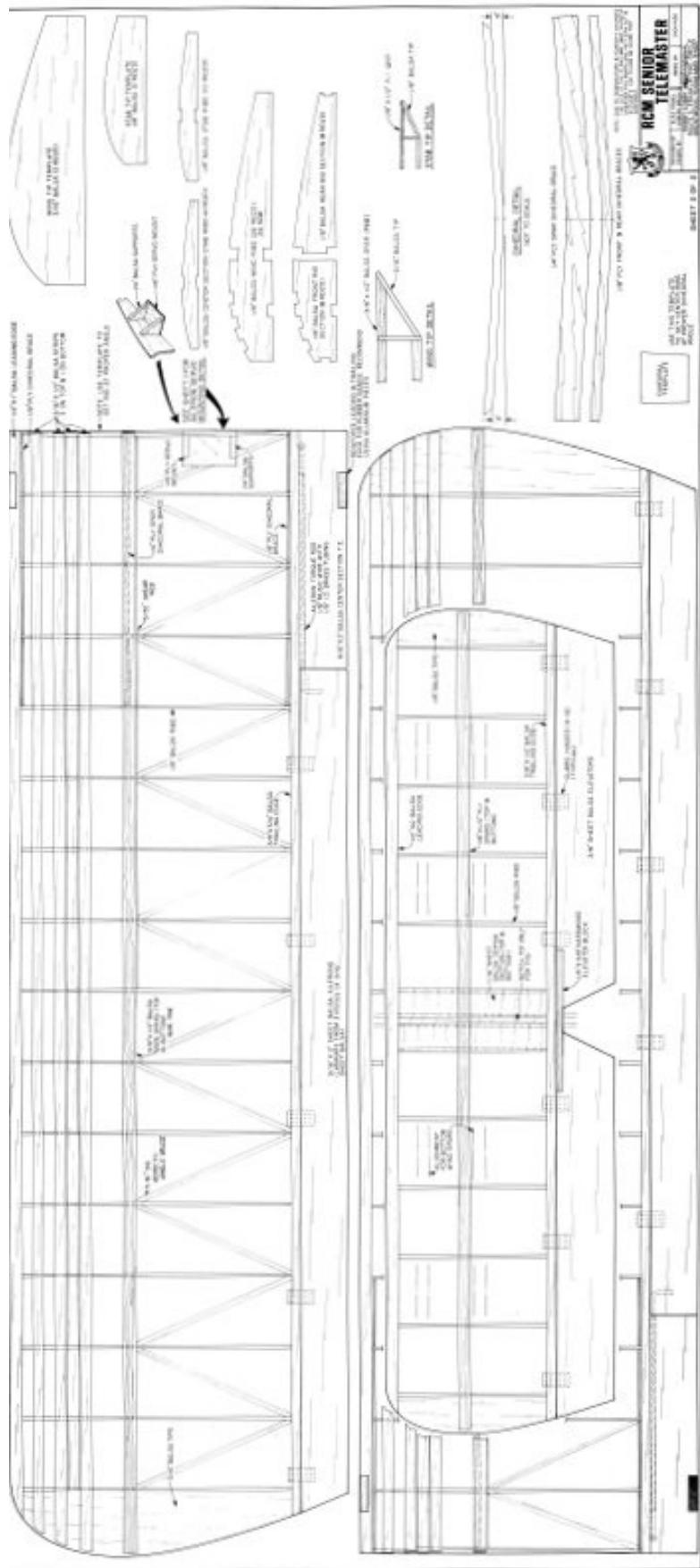
» A few minor modifications have been made ["Minor" means only the structure has been changed, but "a few" means nothing is as it was before.] to improve the structural integrity of the model [The improvement was that it now can disintegrate automatically.], although little could be done to improve the outstanding flying characteristics of this magnificent aircraft. [That's why they found a way to at least impair them instead by using strip ailerons.] «

» While the new version of the Sr. Telemaster looks like the original machine once kitted in Germany [That's about all they have in common.], the new one boasts some design changes. [So it badly needs to.] The changes were made both to simplify the construction [Because the original was known to be complicated, wasn't it?] and to offer a stronger airframe [Because the whole world knows it was fragile, wasn't it?]. The barn door ailerons have been changed to strip ailerons [unfortunately]. They're easier to build and set up [not only, but mainly for the manufacturer] and they offer a stronger wing trailing edge. [Not exactly, it's just replaced by the ailerons.] Heavy spars [because lightweight balsa is too expensive], full length 1/2" x 3/16" strips running along the front of the wing [equally heavy for the same reason and because sheeting is too expensive, anyway], a 1/4" ply spar dihedral brace coupled with 1/8" ply leading and trailing edge dihedral braces [at least they didn't leave out any required braces] add up to a wing that's almost strong enough to make a diving board for the local swimming hole! ["Almost" means far from being strong enough, but flexible enough to be a diving board.] A dorsal fin has been added to the vertical fin for strength. [You never liked the floppy removable tail feathers, anyway, did you?] The stabilizer has been re-designed to make it more twist resistant [That's a red herring, there was no problem before and no redesign, either, they just hold back the good but expensive Nylon covering.] and the fuselage construction has been changed to make the building easier and the airframe stronger [even though you never thought it needed to be]. «

Not to put the article's author down, but wouldn't it have sufficed to just describe the qualities of the new kit design? Why implicitly belittle the original design while many modelers were eagerly awaiting a new Senior Telemaster kit, anyway? But expecting that could be a tall order regarding Ben Strasser was in close cooperation with Joe Bridi and Dick Kidd.

Anyway, now that my steam has been vented I suggest looking at the RCM plans below, again kindly provided by Brad Nichols, to appreciate the very clever design.





In a new [thread at RC Universe](#), the old stories are rehashed again but also a new story added: A balsa shortage due to the building of several LNG tanker ships in the 1970s prompted Alexander Engel to replace the balsa sheeting by brittle hard foam (Duracell), which is actually unsuitable. Even though this story may be true, it doesn't detract from the above reasoning.

Today, the German [Alexander Engel KG](#) (since 1993 owned by the founder's son) offers the Precedent T240 as an explicit Senior Telemaster successor, even called [Telemaster T240](#). Over many years they had the old Telemaster models in their product line. Obviously, these still have been produced by Balsacraft in England, as today is the line of Precedent Txxx models. At least the T240 looks like a modernized, enhanced, and embellished version of the Senior Telemaster, derived from the original German design. And the ad text reads like trying to connect with the old times:

» Like its predecessor, the legendary Senior Telemaster, also the T240 gives an impressive display in all areas - as a tug and a load carrier or just as an easy "Sunday flyer". The big payload and the roomy fuselage open up nearly endless opportunities, like installation of a still or video camera or skydiver dropping and much more. «

From the Engel website:



Nothing is known about who owns Balsacraft and why they don't sell in the USA (or do they?). The Precedent models are marginally known in the UK and in Germany, while the USA and the rest of the world are still dominated

by Hobby Lobby and their "own" (Bridi-design or Hunt-design) Telemasters. Seems it was an extremely successful acquisition in 1975.

The Giant

Nothing flies like Senior Telemaster? The Giant Telemaster does it after all. This is the biggest of all Telemasters, offered by [Hobby-Lobby](#) as a kit, which is manufactured by [Aero Craft Ltd.](#)



Presumably, this is Craig Wagner of Aero Craft Ltd posing beside the model to show its size. Wingspan is 12 ft / 3.6 m and wing area 3050 sqin / 197 sqdm. Length is 90 in / 2.3 m. The overall flying weight may be as low as 23 lb / 10.5 kg.

At least this is Craig Wagner beside the uncovered airframe. The designer Tom Hunt calls the model "The Balsa Overcast". Here you see why. But you see as well that the Giant is built at least as lightweight as the Senior. There's an informative [thread on RC Universe](#) where you may see it as well.



The flight characteristics of the Giant are more than similar to those of the Senior, at least more than you may think. The geometry is simply scaled up and the structure is even more filigree. Now both models have exactly the same 17 oz/sqft / 52 g/dm wing loading. That means the Giant flies as slow and lands as short as the Senior, but – considering the size – this looks even slower and shorter. Now all is really slow motion.

The model was rendered in REFLEX by scaling the parameters. The visual model got the same paint scheme as the Senior but in green color. This was the only basic color left and actually I didn't like it as much as the others, but for the huge model it's surprisingly good.



The most obvious differences to the Senior were incorporated into the visual model. The wing dihedral is reduced and lift struts are added. The aluminum plate landing gear was replaced by a wire landing gear, which is lightweight but still able to carry the airframe's weight. Ailerons and flaps are enlarged to 25% of the wing's chord length (instead of 15% on the Senior). There is no flaperon version.

The two recommended drives are rendered in REFLEX models. Primary recommendation is an electric drive, consisting of an [AXI 5330/24](#) brushless outrunner motor, an APC 20x11" Electric Flight propeller, a Jeti Advance plus 90 ESC, and a 10s1p 4000 mAh LiPo battery. The drive parameters for REFLEX were calculated using [Drive Calculator](#). Secondary recommendation is a Zenoah ZG-26 gas engine. [Tony Clark](#) in Germany offers the enhanced ZG 26SC and shows a performance diagram. Static thrust with an 18x6" MenzS propeller was estimated using [ThrustHP Calculator](#).

Both drives pull the model with authority. The electric drive is quiet, clean, has no vibrations (if balanced), and is easy to operate. Full-power run time would be only 4.5 minutes, but in cruise flight the current draw is so low that there will be up to 15 to 20 minutes flight time. It's possible to add a second battery (1.04 kg / 2.3 lb) and double flight time. That's good for just flying around and for aerial photography/video.

If the model is used as a glider tug, though, a gas engine may be preferred. The Giant Telemaster is very well suited for towing big *slow* gliders with a wing loading and airfoil similar to those of the TM. If there are only one or two flights in an hour or two, the electric drive will suffice. The gas engine, on the other hand, needs only 34 oz / 1 liter fuel for one hour of towing, good for hauling several gliders in succession.

The ZG 26 is recommended as smallest engine, but I would avoid bigger engines or at least strengthen the airframe to cope with the vibrations. The

ZG 26 with a low-pitch propeller gives much thrust, enough for both a glider and the Telemaster itself, which is lightweight like a glider. A higher-pitch propeller would only waste power because the model isn't able to fly fast, anyway.

Even with the low-pitch propeller the model should be somewhat strengthened for towing. The tow-release has to be on the upper side of the fuselage just behind the wing. I would build special longerons from the front bulkhead to this point so the tow forces don't affect the fuselage structure. This would not be difficult because the Giant has a modified fuselage and wing center section, which is not rendered visually, though.

Also the gas engine is not rendered in the visual model. It would be much work to build such an engine for REFLEX. I simply put a glow engine up front so just don't look at it. The AXI electric motor is rendered quite correctly, but the sound is only the generic REFLEX electric sound. The gas engine has the Zenoah G20ei sound, though, which was extracted from a video Rich Noon presented in his [review on RC Groups](#).

Scaling up the Senior Telemaster produced the parameters for the flight characteristics. The Hobby-Lobby Web page says the horizontal tail has 672 sqin area while scaling up the Senior gave 724 sqin. This difference is not explainable and was ignored. The wing dihedral was reduced to 1 degree, which is estimated from several pictures in the Web. The huge model flies even smoother than the Senior. There seems to be much dynamic stability.

The effects of the longer-chord flaps were derived from the Senior TM values, which are only rough estimates. The pitching moment is even bigger what makes flare for a three-point landing quite hard, but it's still possible using the trick mentioned above. The drag is a bit higher, too, but both drives let the model climb even with flaps deflected 45 degrees. Though the flap parameter values are my best guesses they might be completely wrong. All I can say is that the model's flight behavior is plausible and generally realistic.

There may be some flaws in the REFLEX models of the Giant Telemaster that just can't be avoided due to lack of material and information. The flight behavior in the simulator should be pretty close to the real one, though.

This shall be demonstrated in the demo flight "Giant Telemaster 26ccm". You'll have to download and install Horst Lenkeit's "MFG Uetze" scenery from [RC-Sim](#) to view this demo flight. Alternatively, you may view a small [video](#) of this demo flight, for instance if you don't own a copy of REFLEX.

Some fellows complain such a nice model shouldn't sound like a chainsaw, what is quite true because the Zenoah engines are primarily used for chainsaws. Nevertheless they are cheap, robust, reliable, and powerful engines making model flying easy and enjoyable. But some four-stroke glow engines are not too bad, either. Especially the Saito FA 125A is such an alternative and was assumed for another setup of the Giant. The REFLEX model's sound

was extracted from a video Rich Noon presented in his [review on RC Groups](#). Now it sounds just like a single-cylinder motorcycle.

The drive parameters of both the gas and the glow version are guesswork, but they should be not too far off from reality. Anyway, the Saito is just as powerful as the Zenoah at even lower rpm and half the weight. The Giant now weighs only 21.5 lb / 9.7 kg. Again, a low-pitch propeller (16x6") was assumed so the model will take-off after a few feet and climb steeply. High speed is not Giant's business so a different propeller would waste power (and energy).

The Saito engine seems to be an interesting alternative even in reality. It's only slightly more expensive than the Zenoah and is said to be just as reliable and easy to handle. Now that gas fuel has become more expensive, even fuel cost might be comparable. If your club manages to get Methanol in bigger quantities (synthetic oil and a bit nitro should be no problem) it might cost just as much as automotive fuel. And a four-stroke should be a thrifty engine.

Floats

The Senior Telemaster is known to be a good floatplane. After the successful creation of a water look-alike in REFLEX sceneries, the Senior's water flying abilities may be demonstrated also in the simulator, at least approximately.



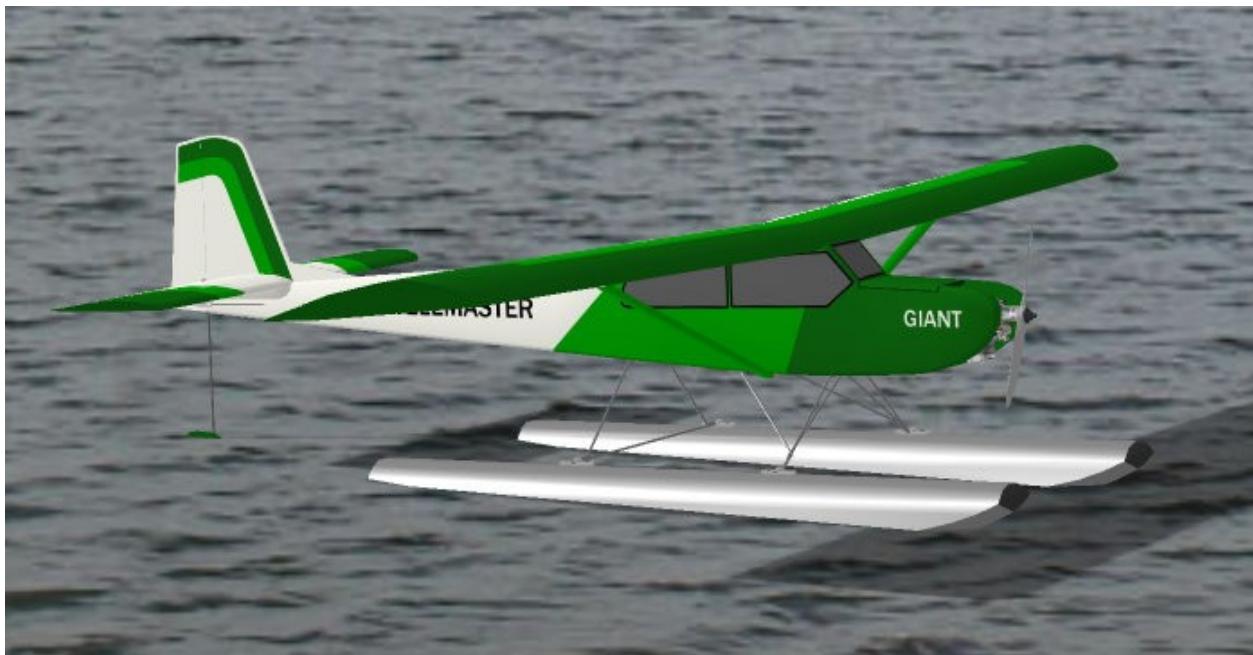
The floats are supposed to be semi-scale round-top [Sea Commander floats](#). Chuck Cunningham's [article](#) has an excellent overview over float design for models. Bruce Stenulson's [article](#) gives a step-by-step description of float sizing and set-up. More advanced is Ed Westwood's [article](#) on float design.

Following the rules given in these articles, the floats are 45" long what is 75% of the distance between the propeller and the rudder hinge line. (Only later I noticed that Frank Schwartz in the [post on RC Universe](#) mentioned the Hobby-Lobby floats were 36" long.) Sea Commander floats of this size weigh 25 oz / 0.71 kg what is supposed to be the weight of both floats. Senior Telemaster's weight was increased by this amount, assuming the additional float struts weigh as much as the dropped wheels. The center-of-gravity was lowered and the moments-of-inertia were increased accordingly.

The floats were positioned so the normal landing gear struts reach down to them and the propeller's clearance is retained. Because the wing's incidence angle is quite big, the floats' top is parallel to the model's centerline. The step of the floats is on a line inclined 8 degrees back from the vertical, going down from the balance point below the wing's main spar or slightly behind it.

As recommended by Chuck Cunningham, there are no water rudders on the float transoms but a single water rudder on an extension of the rudder hinge pins, just instead of the tail landing gear. Sort of an aluminum landing gear

with horizontal struts requires no diagonal struts or wires for the floats. This is far simpler than reproducing every detail of real floats. After all Telemaster is a utility model and not a scale model.



The Giant Telemaster turns out to be an even better floatplane due to its sheer size and due to the effective barn-door ailerons and flaps. The floats are now just 68" long and weigh 60 oz / 1.7 kg. Because there was already a wire landing gear, the float gear was made following Chuck Cunningham's recommendation.

Because a wooden propeller on a floatplane is not a good idea, both Senior and Giant got a plastic propeller. The Senior now has a Super Nylon and the Giant an APC Sport.

Both the Senior with the .60 glow engine and the Giant with the 26 ccm gas engine have more than enough power. Water take-offs are short even without flaps, and despite the big float drag, steep climbs are possible even with full flaps. Of course, steep descents and short landings are possible with and without flaps.

Yes, I know that water flying in REFLEX is not quite realistic, but it is still quite good. If you handle the seaplanes as you would in reality, it will look similar to real water flying. At least you may enjoy the look and feel of seaplanes in the simulator. This should be demonstrated in a demo flight named "Giant Telemaster 26ccm on floats". If the Telemaster installer didn't it for you, download and install Harald Bendschneider's "[Baggersee](#)" scenery from his Web site www.Szenerien.de to view this demo flight.

Conclusion

While the REFLEX model cannot be *completely* realistic at all, it yet shows the essence of the real model's flight behavior, which might be described as "smooth" and "steady". So just enjoy the look and feel of this classic model!

But if you're one of those expert Telemaster pilots I'd surely like to hear any corrections or suggestions from you.

Enjoy!

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<http://time.fh-augsburg.de/~erd/Modellflug/textReflex.html>

More REFLEX models and the latest versions are on my page

<http://time.fh-augsburg.de/~erd/Modellflug/textDownloads.shtml>

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