EDITOR'S NOTE: The Flying Manual is proud to present these plans for one of the neatest light biplanes that has ever been designed. Unfortunately, the how-to-build article could not be written by the designer, George (Bud) Gere, Jr. While testing out an ice sled on January 18, 1931, he was struck by the propeller and suffered fatal injuries. At that time he had completed the ship itself and was working on the motor adaptation. Through the efforts of his father and of aviation friends familiar with Bud's plans, the ship was completed and successfully test flown last fall. Experts who have viewed it have pronounced it one of the finest lightplanes ever designed, and it will fill the bill handsomely for those readers who have been clamoring for a practical biplane design. The original Gere ship has been acquired by the University of Minnesota, whose aeronautical engineering department is using it in its classrooms as an example of fine design and painstaking craftsmanship.

PART 1

Plans for the GERE Sport Biplane

by DOUGLAS ROLFE

Late last fall, shortly before the snow began to fly, a trim maroon and cream biplane was wheeled out on the tarmac at Wold-Chamberlain airport in Minneapolis and made ready for its initial flight. The ship was a beautiful creation indeed, eliciting words of enthusiastic praise from the air-wise onlookers fortunate enough to be among those present.

Elmore Wall, well known Twin Cities pilot, settled himself in the cockpit, gave her the gun, and the Gere sport biplane took to the air with the eagerness of a bird returning to its native element. She behaved wonderfully well in the air. Every aspect of the test flight was well nigh perfect—everything except the absence of George (Bud) Gere, Jr., the young man who designed and built her.

Bud could not be there. Weeks before he had gone out to White Bear Lake with a party of friends to test a newly built iceboat. In attempting to dislodge a frozen sled runner, Bud had slipped into the arc of the propeller and his injuries had proved fatal.

But the airplane which he left behind him,
which had been his labor of love for months, was
done except for installation of a motor. Bud's
father, familiar with the plans and hopes of his
son, carried the ship through to completion with
the assistance of friends who had worked with Bud
during the hours when his creation was taking
shape. The Chevrolet motor which Bud had been
converting was finished up, cowlings installed, and
Elmore Wall took the ship up in a test hop.

Results were so satisfactory that the editors of
the 1933 FLYING MANUAL take great pride in pre­
senting the complete plans for the Gere Sport Bi·
plane. The ship, as will be seen from a study of ac­
companying photos, is reminiscent in appearance
of the latest type of army pursuit plane. No finer
piece of craftsmanship has ever come to my atten­
tion. The job is so well built that it would be a di s·
tinct credit to both the designing and co nstruction
departments of any up-date airplane fac­­tory.

Now Owned by University

Additional testimony as to the technical ex­­cellence of the plane — if any were needed beyond
its performance in its trial flights — is afforded
by the fact that the original ship has now become
the property of the University of Minnesota. Prof.
John Akerman of the University's department of
aeronautical engineering was so impressed with the
Gere biplane that it now stands in his class room
where groups of engineering students can study it.
Prof. Akerman himself is noted as the designer of
several production planes, and his seal of approval
is just one more bit of evidence as to the favor with
which aviation experts have accepted Bud's ship.

When the editors asked me to prepare a set of
plans for F M readers who have been clamoring for
plans of a ship as efficient as the Pietenpol Air
Camper but of biplane rather than monoplane con­­struction, I was both pleased and dismayed.

Plans Presented Step by Step

Pleased because from what casual knowledge
I had of this ship I knew it to be an unusually in­­teresting airplane — dismayed because I realized
that only the builder could do justice to the diffi­­cult matter of presenting a "how-to-build" article
of his own design. This being impossible, I have
endeavored to present in the most lucid and concise
manner the step by step procedure necessary to
reproduce the Gere design. The drawings and pho­­tos which accompany this article have been chosen
with great care, the intention being to cover every
important detail of the construction in such a man­­ner that they will be practically self-explanatory.

To Mr. George Gere, Sr., and others who have been
of assistance to me in preparing this article, I wish
to extend my thanks.

Before going into the details of the design a
few words are in order about the ship itself. As a

GERE SPORT PLANE SPECIFICATIONS

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length over all (depending on motor used)</td>
<td>Approx. 16 ft.</td>
</tr>
<tr>
<td>Span, upper wing</td>
<td>19 ft.</td>
</tr>
<tr>
<td>Span, lower wing</td>
<td>18 ft.</td>
</tr>
<tr>
<td>Chord, upper and lower wing</td>
<td>36 in.</td>
</tr>
<tr>
<td>Stagger</td>
<td>17 in.</td>
</tr>
<tr>
<td>Angle of incidence, upper</td>
<td>0 deg.</td>
</tr>
<tr>
<td>Angle of incidence, lower</td>
<td>1½ deg.</td>
</tr>
<tr>
<td>Dihedral, upper</td>
<td>0 deg.</td>
</tr>
<tr>
<td>Dihedral, lower</td>
<td>2½ deg.</td>
</tr>
<tr>
<td>Maximum speed, with Ford A motor</td>
<td>80 mph</td>
</tr>
<tr>
<td>Maximum speed, with Ford T motor</td>
<td>75 mph</td>
</tr>
<tr>
<td>Maximum speed, with Szekely 40</td>
<td>95-110 mph</td>
</tr>
</tbody>
</table>
Both Chevrolet and Ford motor mounts are given in this drawing. The Chevrolet motor is suitable for short hops and field flying, but it is not recommended to those who want to get full efficiency from the clean lines of the plane. A Model A Ford motor is recommended as being probably the most satisfactory compromise between price and power.

Simplicity of the Gere design is well shown in this drawing. The lower wing has a dihedral of 2½ deg., and is staggered 17½ in. behind top wing.

Completed fuselage structure with cockpit fairing and turtle deck in place, but without side fairing. Check with dimensioned drawing on opposite page.
one-place biplane of practically all-steel construction it may be put down, structurally speaking, as one of the finest lightplanes ever built. There are many advantages to the biplane type, particularly when speaking of lightplanes, and this is especially true when the plane is to be built by an amateur.

In this direction and others the Gere plane seems to fill the bill exactly for anyone who wants a real honest-to-goodness airplane that is not only well designed but also has definite class. Anyone who has had the good fortune to examine the ship as Bud Gere himself conceived and built it is bound to be impressed with the clean lines, the simplicity and ruggedness of construction and the great possibilities of the design. It is difficult to realize that this is the work of an amateur designer and builder. Every detail is so carefully worked out, the finish so excellent and the common-sense attitude of the designer so apparent in every phase of the construction that it would do credit to any reputable aircraft manufacturing concern.

**Welding Requires Care**

While the straight lines, squared-off wing tips and simple landing gear make it easier to build than many lightplanes, it is just as well to face facts and recognize that here is a plane employing welded tubing and welded fittings for every important member except the wings. Those who can’t do a good job of welding (or who are unable to obtain the services of a competent welder) had better not monkey with this design.

Another matter which might as well be taken up right now is the choice of a power plant. Although the ship was completed with a Chevrolet engine and the accompanying plans consequently deal with this particular installation, there is not the slightest doubt but that Bud Gere, had it not been for his untimely death, would have installed a more suitable motor. While the Chevrolet motor will serve for straight hops and possibly some field flying, it is emphatically not recommended to those who see in this design an answer to their prayer for a speedy, sturdy little sport job. The motor in question is altogether too heavy and the power output too low.

We recommend for practical use either the Model “T” or Model “A” Ford engine. These two motors have proven satisfactory under strenuous flying conditions and are furthermore easily adapted to the original Gere design. To supplement this recommendation a suggested Ford motor mount is incorporated in the accompanying plans.

For those who can afford it the Szekely 40 hp radial (three cylinder air-cooled) is about the best bet. With this engine complete with drag ring the Gere plane will make one of the snappiest little sporting jobs ever turned out — the sort of ship you could take to the National Air Races and feel warm all over because you happened to be the owner-builder.

Another motor well worth considering, especially for those who would like to build their own power plant too, is the “Packmag Twin.” It has ample power, same as the Szekely, and has such low frontal area that it makes an ideal motor for this plane. Complete plans for the “Packmag Twin” are available from MODERN MECHANIX AND INVENTIONS blueprint department for $5.00. Castings are also available. Ask for prices.

Now, in spite of our recommendation that the Chevrolet motor should not be employed, it is only fair to point out that the ship was actually test flown with one of these engines and did in fact behave surprisingly well. Pilot Elmore Wall, who conducted the tests, has nothing but praise for the flying qualities of the ship and waxes enthusiastic about the behavior of the controls.

This latter fact is something worth mulling over, as the most persistent criticism of the lightplane as a class hinges almost entirely upon its reaction to the controls. As Elmore points out, the very fact that the ship flew so well with a motor
weighing 300 lbs. (the total weight of the ship, less motor, is only 306 lbs.) and developing a doubtful 19 hp is in itself a striking tribute to the soundness of the Gere design.

So, when you build your Gere plane, plan on using either a "T" or an "A" Ford engine, or, if you want a young pursuit job, try and lay your hands on a Szekely 40 radial. Best of all, build a "Packmag Twin" and step out with the best of 'em. Complete conversion plans for the Model "A" Ford are published in the 1932 FLYING MANUAL.

You will observe that the subject of converted motorcycle engines has been studiously avoided. They are absolutely unsuited to the Gere design and should be avoided as the plague. Now to take up the actual construction.

The Fuselage

Building a steel fuselage is a precision job. Furthermore, the welding must be done by someone thoroughly versed in the noble art. Slipshod methods, never to be condoned but which occasionally pass muster in minor details, are absolutely out when it comes to the fuselage or indeed any of the welded fittings.

Study the plans for the fuselage carefully. All sizes and measurements are given in the drawings and it would be a useless waste of space to repeat them here. It is also of little value to give literal instructions on the actual steps necessary to build the fuselage, as this information is available in graphic form in the 1932 FLYING MANUAL. On page 11 in this publication Mr. Pietenpol covers the subject in the clearest possible manner. With the exception of the dimensions, which naturally follow the Gere plans, the procedure is identical to that described so thoroughly by Mr. Pietenpol in the article referred to. He also takes up the matter of the longeron splice which occurs in the Gere fuselage.

The Motor Mount Lugs

When the fuselage structure is completed the next step is to make the motor mount lugs. These, as can be seen by referring to the plans (see also photos and diagrams on accompanying pages), are made of cold rolled steel (C.R.S.) and are inserted

Complete lines of fuselage layout and miscellaneous fuselage fittings are given on this page. Welded tubing is used, since the design is in strict conformity with the latest approved practices in plane construction. Welding must be carefully done. Follow the plans closely and do not depart from them in any respect. You might improve the design—and you might not!
and welded into slots cut into the slightly projecting longerons immediately forward of station No. 1. In no part of the fuselage is more care essential than at this point. Remember: the entire motor installation depends upon these four lugs and their perfect security.

**Miscellaneous Fuselage Fittings**

Now we can turn to the lugs for the landing gear, center section struts, flying wires, lower wing fittings, and the tail group. All these are made from 1/4 in. C.R.S. They are put in their respective places and welded on. In the original design the center section struts are welded directly to the upper longerons at stations No. 1 and No. 2. This may be done, but our advice is to make moving joints of these points of attachment, in which case four more fittings should be made exactly like the front landing gear fitting and welded into place on the upper longerons at stations 1 and 2.

Details of the landing gear struts, by the way, are clearly shown both in photographs and detailed drawings illustrating this article. Two front wing fittings and two rear ones are needed. They are all made from 1 in. by 1/8 in. C.R.S. and shaped as shown in the detail drawing. As the front spar is 3-13/16 in. deep and the rear spar exactly 3 in. deep, the fittings should be shaped to accommodate these sizes. Both front and rear fittings are extended and bent as the sketch shows to form lugs for attaching the wing bracing. When all the fuselage fittings are welded in place, the entire fuselage should be thoroughly coated with a good dose of linoleum.

**The Landing Gear**

The landing gear is our next point of interest. This is shown in such extreme detail that additional comment is superfluous. The tail skid, a painfully simple member in the Gere design, is also taken care of on this page of detail and should be made and fitted at this time.

**The Motor Mount**

This is an open question. As this ship is adapted to practically any type of motor not exceeding
60 hp, the details of the motor mount will depend almost entirely upon the builder’s choice of a power plant. A mount suitable for a Ford “A” installation has been suggested. Complete details of this type of mount can easily be obtained from the 1932 FLYING MANUAL, where it is described in connection with the plans for the Pietenpol Air Camper. Similar data can be obtained on the Ford “T” mount by referring to page 36.

Although the Chevrolet engine is not recommended, we feel that there will be a number of builders who may wish to install this engine temporarily. The plans for this mount are consequently given in some detail. One more word on the subject of Ford conversion motor mounts — and Chevrolet. If either of these motors is used, it should be set back a full 4 in. more than the plans show. This change is the result of test flights made since the plans were drawn. In any case, the best bet is to

Seat construction and further details of the instrument board and its manner of attachment are shown in this plate. Tape is used to bind wooden members to longerons.

Complete dimensions of the Chevrolet motor mount, and the landing gear are given on this page. The tail skid is simple, being made from the fourth leaf of a Ford Model T front spring, bent to the shape shown in the drawing.
leave the motor mounting and cowling until the very last, as the only practical way to establish a perfect balance is by moving the motor an inch or so forward or backward until the proper position is found and checked.

**Fairing and Cockpit Details**

With the fuselage now completed in skeleton form, landing gear in place, and all fuselage fittings securely welded in position, the next logical step is to construct the turtle deck, attach the side fair-}

Wing Details of GERE Sport Biplane

*This chapter shows plans for building the Gere Sport Biplane wings, tail assembly, controls, and control surfaces. When you've finished your ship you'll have a light biplane that is the last word in modern design.*

In case you fellows who have followed this article think I am hipped on the subject, let me confess to a weakness for biplane design. Amateur builders as a rule do not have very much flying time behind them and therefore need a plane which will stand a good deal of banging about. Now, rightly or wrongly, most training ships are of the biplane type and from this we may assume that the type is particularly well suited to hard usage if not actual abuse. Certainly it can combine rugged strength with low weight — two factors which are of supreme importance in any lightplane design.

"The writer's purpose in designing this plane was to make a lightplane that would perform like the ordinary commercial or training plane and be of modern design and construction throughout the entire structure . . . the factor of safety often is maintained throughout and is greater in many places" (from the unfinished notes of George [Bud] Gere).

After reading Bud Gere's stated reason for designing and building this ship and after digesting
the plans and pictures which accompany this article there is little doubt in my mind that you will feel inclined to agree that he just about hit the mark.

As mentioned in the previous installment, everything has been done to try and make the accompanying working drawings self-explanatory. It has also been explained that through unfortunate circumstances the builder of the original ship was unable to complete the plans himself.

Now it is literally impossible in the limited space at our disposal to cover every single detail of any airplane design and the prospective builder must be prepared to exercise a certain amount of ingenuity and generally use his own head. These remarks are particularly directed to those who may feel the urge to write in and complain that I have not covered the entire ship.

My personal opinion is that builders will always take certain liberties with one or more details of the design they are reproducing; and for various reasons, not the least of which is the desire to incorporate some little improvement of their own — fancied or real — into the finished job. Which seems to me a healthy attitude deserving nothing but praise so long as the important features of the design are not tampered with.

For the builder who is tackling his first job and who therefore is rather at sea when it comes to tackling some of the construction operations I can think of no finer advice than to recommend the purchase of a copy of the 1932 Flying Manual. This is literally a mine of information and contains not one but several airplane building articles. Written as they are by different designers and specialists, these articles are of unusual value to the amateur builder and a careful perusal of this volume will put the reader in possession of just about all the
written knowledge necessary to build the Gere plane from the plans furnished here.

Now having got that off my chest let's proceed with the work in hand:

**The Wings**

You will see by the drawings and photographs that the wings are cut off square at the tips. This eliminates the making of curved tips, which are hard for most amateur plane builders to make all alike. There is so little loss in dynamic effect in using a flat tip on a plane of this size and type that the additional work involved in making curved tips is not warranted.

The spars are designed large enough to permit the use of pine if spruce is not available, but spruce is recommended. They are 1 in. thick. The depths of front and rear spars respectively can be obtained from the working drawings. The spars are not routed to form I beams, as difference in weight is so slight that it would not pay to have it done in a mill and to rout them by hand is a tedious operation requiring a good deal of time and care. Top and bottom edges of the spars should be bended...
This picture was snapped at Wold-Chamberlain airport just after the plane had won her wings in a successful test flight. George Gere, Sr., is seen congratulating pilot Elmore Wall on his expert handling of the plane designed and built by his son.

to meet the form of the rib, this operation naturally being delayed until after the ribs have been made. While making the wing spars it would be a good plan to make the center section spars, one front and one rear, following the drawings for length.

**Wing Ribs**

Each of the two upper wings requires nine full ribs, the two lower wings will each account for another four full ribs and five shorter ribs which extend to the rear spar only. In addition to these four more full ribs will be needed to complete the center section, making a total of 30 full ribs and 10 shorter ribs to be made before the wings and center section can be assembled.

The ribs are made from \( \frac{1}{8} \) in. by \( \frac{3}{8} \) in. spruce with gusset plates of \( \frac{1}{32} \) in. fiber. This latter material is obtainable from most electric supply houses and is recommended in preference to plywood, which, though permissible, is more difficult to handle.

After laying out the rib jig from the drawings, steam the cap strips until they are pliable enough to be bent; then place them in the jig. Next cut the truss strips to size and set in place, brush plenty of waterproof glue into each joint and nail the gussets on, taking care to use plenty of glue on each gusset before setting it in place.

Twelve compression ribs — three to each wing — are specified in the plans. These are illustrated in detail on the wing drawing. They are made by stiffening the ordinary ribs at the points specified. It would be a good plan to make all four ribs for the center section in this manner. The slight increase of weight is nothing in comparison to the extra stiffness which will result from this treatment.

When all the ribs have been completed and the spars shaped to accommodate them the wings are almost ready to assemble. First, however, the spars have to be drilled for drag fittings, interplane strut fittings, etc., and the fittings themselves made. Follow the plans for these units. Drill the rear spar of each lower wing to accommodate the
aileron hinge bolts and cut the fuselage end of all the lower spars to an angle of 10 deg. This angle is necessary in order to secure a snug fit in the wing fittings attached to the fuselage on account of the dihedral angle of the lower wing.

The wings may now be assembled. Slip the ribs in place, following the plans for position, and secure in place. Bolt the drag fittings in place and rig the wing with No. 10 aircraft wire, using 325 SF turnbuckles to tighten. Great care should be taken in rigging the wings to insure that they are finished absolutely true.

False ribs extending from the top of the front spar to the leading edge of the wing and situated between the main ribs are advisable. They are not shown in the drawings but can quickly and easily be made by taking lengths of 20 ga. hard wire and shaping it to the contour of the nose ribs. The ends of these wire nose ribs are pressed firmly into holes drilled in the front spar and the leading edge. If a more powerful motor is considered it will be advisable to cover the entire leading edge of the wings from the front wing spar to the leading edge member with 1/32 in. plywood. This in addition to the false ribs already mentioned.

**The Center Section**

The center section is the next point of attention. Spars and ribs for this are exactly similar to the main wing construction, with the added suggestion that all four ribs be stiffened in the manner prescribed for the compression ribs. The spars should be drilled to take care of the upper wing fittings before assembling.

On the original ship no provision is made to carry either surge (water) or gas tanks in this member. It was decided later to incorporate one or both of these tanks into the center section and our recommendation is that actually both tanks should be located here. It will simplify things generally and in consequence of this decision a layout showing this form of installment has been added since the first plans were made — this layout will be found on the continuation pages.

It shows the disposition of the two tanks and you will see that this arrangement makes a slight change in the rigging essential. The tanks occupy the spaces between the ribs left and right, the center space being rigged with No. 10 aircraft wire the same as the wings. So before drilling the center section spars it will be necessary to check with the
Extreme simplicity of the Gere tail unit makes these plans self-explanatory.

The late Bud Gere surveying his handiwork. This photo emphasizes the all-around sturdy construction of the ship.

Note that the vertical rudder is the only cable-operated control.
additional layout referred to.

The center section strut attachment system is shown in the drawings.

Ailerons

Ailerons are employed on the lower wings only. They are built up in the same manner as the wings and are attached by three hinges which are shown in detail on the drawings. The aileron control is operated by torque rod and bell and crank. This control, also shown in detail, should be made and fitted before attempting to cover the ailerons and wings. The entire framework of ailerons and wings should be given a good husky coat of varnish before covering, and if you have any misgivings about the covering operation itself drag out the old 1932 Flying Manual again — it tells all about it there!

Tail Assembly

The entire tail assembly is so thoroughly explained in the detailed drawings that little comment is necessary. As it is a welded job from start to finish the same care should be lavished on this unit as has been already given to the fuselage. Make the necessary hinges for flippers and vertical rudder and all other fittings shown in the detail. After the assembly is completed check for fit on the fuselage, as it may be necessary to make a few alterations and this is more easily attended to while the framework is still uncovered.

The Controls

These have been covered in great detail in the working drawings. One of the outstanding features of the Gere plane as Bud built it is the excellent operation of all the controls. As will be seen from the drawings, positive control is used in all cases with the exception of the rudder control, which is operated by cables. The location of the control column and rudder bar is not arbitrary — these units may be placed in what seems to be the most comfortable position for the pilot. This being the case, control rod lengths and similar measurements will have to be determined by the builder to suit his needs.

Instruments

The only essential instruments are the oil gauge, tachometer, altimeter, air speed indicator and switch. For those who have the means the combination instrument panel as used by Gere will add a finishing touch to this smart little ship, but it can of course be dispensed with.

Wing struts are covered in detail drawings. The diagonal strut should be cut to the proper length before welding and a jig should be used in assembling both the outer bay struts and the center section struts. The center section struts are welded to the spar fitting at the top, but we recommend a moving joint at the fuselage point of attachment. This is not necessary and if the builder prefers he may dispense with fuselage fittings and moving strut ends at this point, merely welding the lower ends of the struts direct to the fuselage. Flying wires and wing bracing generally may be either ¼ in. streamline cable or stranded cable. Although
Each individual builder will probably have ideas of his own when it comes to the engine cowling, which will have to be modified to suit the particular power plant selected. The above sketches will be helpful where Ford or Chevrolet engines are used. Straight lines carry out the general lines of the ship and are easier to handle. Start by making paper patterns.

The unusual radiator mounting shown here is used with Ford type motors as well as with the Chevrolet seen in these pictures. If an air-cooled motor such as the Packag Twin is installed, the radiator is, of course, eli-
some may feel like using ordinary aircraft wire for rigging the wings, it is not desirable and should be avoided. Rig the ship with great care, as the wings must be true in every respect.

Covering

Use a good grade of airplane fabric throughout and give six coats of dope, using pigmented dope for the last three coats. Added attractiveness is obtained by finishing the ship in one of the many striking color combinations which Berry Brothers, Detroit, furnish on request for a nominal sum — if indeed they make any charge at all.

Miscellaneous Details

The motor cowling will naturally depend on the type of motor selected. However, if a Ford Szekely or Packmag Twin type is employed it will be necessary to check the weight and point of balance before making a motor mount to accommodate the engine. In any case, it will be advisable to check the point of balance whatever motor is used, before drilling the engine bearers and bolting the motor down. A good plan is to shift the motor back and forth along the bearers until the proper balance is obtained.

If a water cooled motor is used, a remote temperature gauge should be fitted and the motor always run up to about 150 deg. F. before attempting a take-off. A Paragon 10 J 60 in. propeller is satisfactory for the Chevrolet motor. For Ford motors, use the propeller recommended by Mr. Pietenpol and for other motors obtain the manufacturers’ advice on the subject.

J. D. Granath of Chicago, inventor of the automatic variable pitch propeller and the Hi-Turb power head, is now working on a new type of airplane wing which must be taken seriously, since his success as an inventor is already firmly established.

The drawing below shows a mid-wing plane equipped with this wing. Owing to the pull of gravity on the struts at all times, the wings will automatically bank to the correct angle in turning. The cantilever wings are hinged on a central axis.

How the Granath Wing plane will appear in flight. Centrifugal force and gravity will automatically keep the wings at the proper bank, although they may be banked at the pilot’s will by the usual action of the stick and ailerons.