

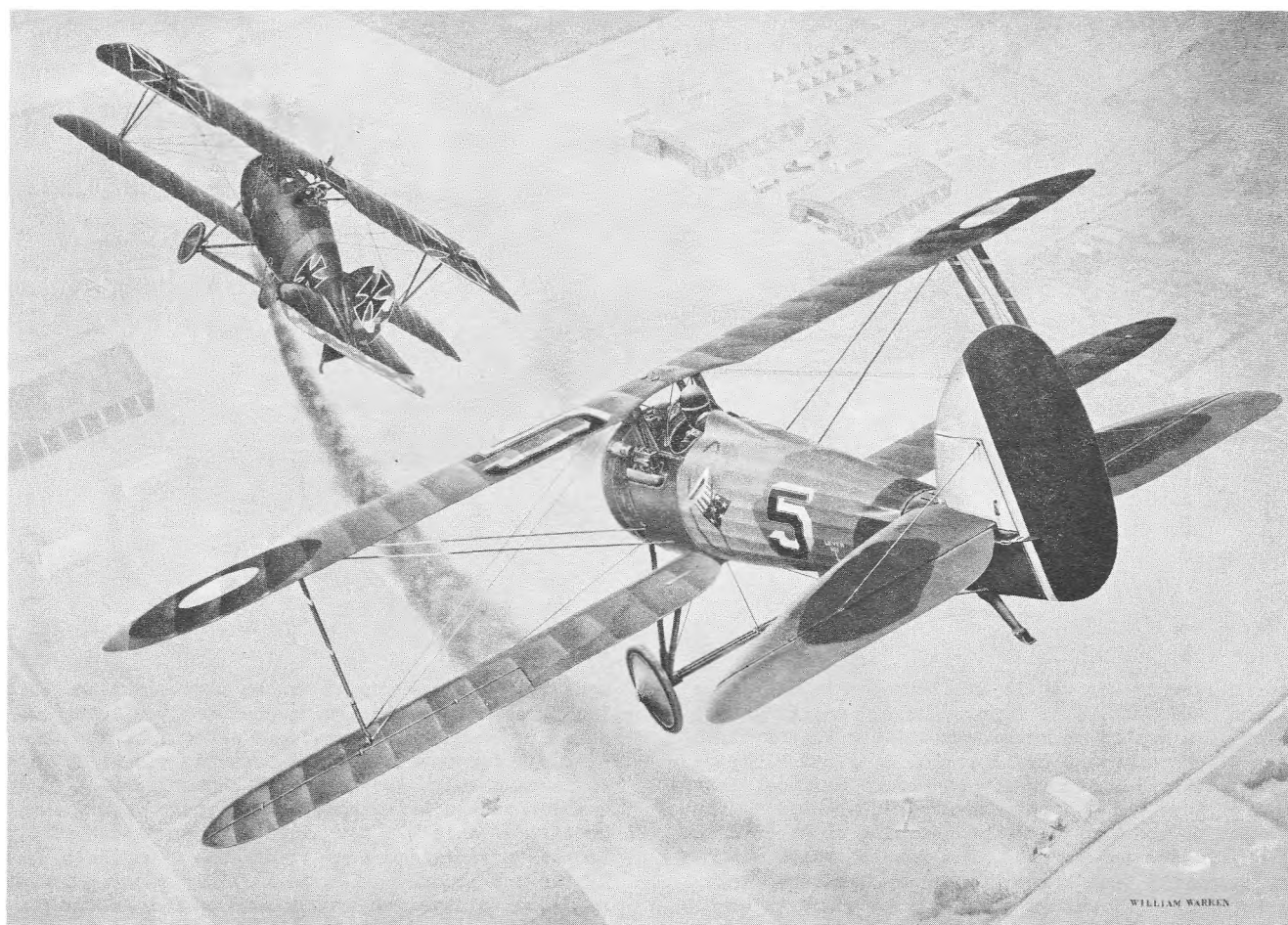


Illustration by William Warren

Line, Shade, and Shadow

by JIM DUNAVENT

In the sixty years that have passed since Wilbur and Orville filed the first flight plan, the lure of the air has beguiled artists into drawing, painting, etching, and otherwise limning flying machines of every description in nearly every conceivable situation. The greater part of this pictorialization was done by artists with little or no direct contact with aircraft; the results, as might be expected, were more colorful than accurate.

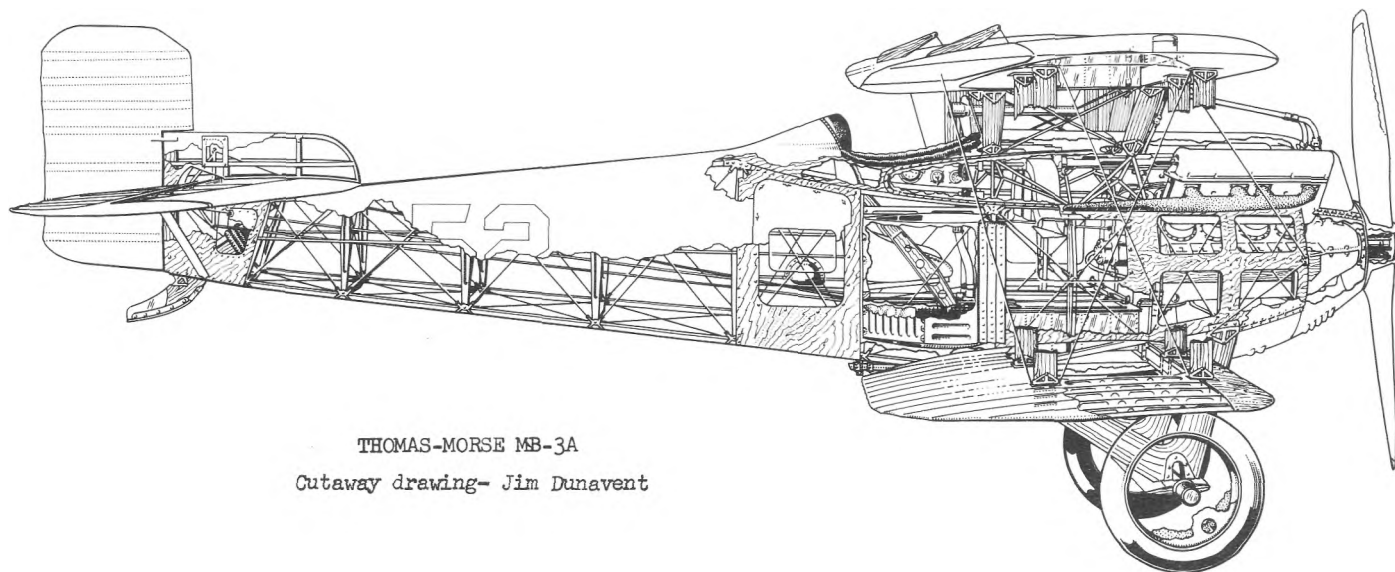
During the mid-twenties there emerged a few sensitive individuals who had both the knowledge and the facility with pen or brush to portray aircraft in convincing manner and in the proper surroundings, both in flight and at rest. Frederic Blakeslee painted literally hundreds of colorful, compelling covers for the numerous air-war pulps that dotted the news-stands during the Twenties and Thirties. Jo Kotula became known to a generation of small boys through his covers for *Model Airplane News*; Clayton Knight and Bill Heaslip were masters of the accurate and draughtsmanlike pencil technique, and their sketches illustrated the Thomson Burtis flying stories, plus many others, that ran in the pages of the old *American Boy* and *Boy's Life* magazines. However, the bulk of the aircraft art, other than these outstanding examples, tended to be poorly drawn and inaccurate...even in advertisements by the aircraft companies themselves.

Today, the technical and pictorial art produced within the aircraft and aerospace industries, and the editorial illustrative material which appears in our

general publications, is immeasurably superior. A new generation of aircraft artists, schooled in the precise techniques developed for use in technical illustration, have combined precision with traditional fine arts practices to produce crisply detailed, colorful presentations of aircraft for historical, technical, commercial, and, last and most important from the A.A.H.S. standpoint, pictorial material that is done for personal pleasure and out of a pure sense of accomplishment. This last category is not confined to working artists alone; there is a large group of talented amateurs who are fully as capable as some professionals. There are also numerous others, not so skilled, who would like to try their hand at aircraft illustration, but are hesitant as to where and how to start.

This article is not intended to be a how-to-do-it short course in either technical illustration or pictorial aircraft art, but it may help to clear up some of the misconceptions and provide a nodding acquaintance with some of the methods used by both commercial and technical artists in layout and rendering of an aircraft drawing.

There are two basic types of aircraft illustration. . .technical and pictorial. Technical illustration is that which shows structural details of an airframe, or the internal arrangement of systems, powerplant, and other equipment within this envelope. Technical drawings may be done as a perspective, but by far the greater bulk are done as dimetric or tri-



THOMAS-MORSE MB-3A
Cutaway drawing- Jim Dunavent

metric layouts for use in maintenance manuals and flight handbooks. The terms dimetric and trimetric refer to a method of measurement along two or three axes of the drawing, and like the original classic isometric system from which they were derived, result in a picture which looks skewed or distorted to the eye due to the lack of foreshortening when sections of any length are shown. As a result, these methods are primarily used for pictorial system schematics or structural breakdown drawings; they are quite complicated and require special templates and scales so they are definitely unsuited to our present purpose, which is the production of a realistic portrayal.

On the other hand, a technical drawing done in perspective can be quite realistic, revealing the airframe as it would actually look if sections of fabric covering or metal skin were stripped away to show the inner structure. The British aeronautical magazine, Flight, for many years featured complete detailed cutaway perspectives of contemporary aircraft which were veritable masterpieces of illustration. For the sake of clarity, most technical art and cut-away drawings are done in black ink-line technique; however, a number of notable examples have been produced by the monochrome (gray wash or opaque technique) for half-tone reproduction. Occasionally one is seen in full color in a national publication.

In pictorial illustration, technical aspects of the subject are played down in order to obtain the desired effect of realism and action. Here, the artist can go as far as he likes from a simple ink outline drawing to a large color painting complete with foreground and background. Excessive detail is the drawback which often ruins an otherwise promising piece of art work...you have all seen drawings or paintings where each rivet head or louvre was faithfully and monotonously applied. This almost invariably results in an artificial, contrived portrayal; the eye does not normally resolve every small detail, receiving its primary impression of movement and mass from the play of light and dark over and around an object. In this respect, a good illustration is far superior to an ordinary photograph, as the camera can only slavishly copy what it sees, while the artist is free to modulate, add, or delete as he sees fit.

Let's assume that you are starting out to do an aircraft illustration, and have assembled all of your source material...photos, drawings, and written description as to markings, coloration, and extra equip-

ment that may not appear on the pictures that you have. The first step is to decide just how you are going to show the subject...at rest, in action, or in a position suitable for working up a cutaway drawing. Before you start on a full-size sketch or layout, make a number of small thumb-nail sketches...very rough ones which will consist of merely a few lines with smudged dark areas to help crystallize your ideas into a tangible form. If the end product is to be a full-fledged painting or an illustration with even a semblance of background, now is the time to start looking through your clippings, or "morgue" for elements that will lend an air of



Illustration - William Warren

realism to the picture. These can be hangars, clouds, vehicles, other aircraft, etc., which are contemporary to the main idea of your proposed picture. The thumbnail sketch is a relatively quick and easy way of getting all of the picture elements tied down into place into a pleasing and workable composition. Once the elements have been chosen and assembled, the full-size sketch, or "cartoon" can then be begun.

At this point the average person, unused to the aids and shortcuts used by commercial or industrial artists, often begins to get feelings of inadequacy. It is fairly simple to achieve a satisfactory small rough, or sketch, of a size which is not suitable for a finished drawing. Enlarging it to a workable size is more difficult, especially without losing all of the original dash and spontaneity which it possessed in the first attempt. If you have a good eye for proportion and are facile with a pencil, it can be re-sketchd in larger format by laying out the major "lines" of composition...the main elements of the picture, as shown in Figure 1,

A somewhat easier method for the less-experienced artist is to "square-off" both the small sketch and the large sheet on which the full-size drawing is to be made. Using this method, you can enlarge the small sketch up to practically any size by simply using the squares as a guide, filling in each one, guided, of course, by the main composition lines and the angle at which they intersect with the vertical and horizontal guide lines. However, this is a rather laborious process, and has been largely supplanted in commercial establishments by the use of photostats, or by using an opaque projector (camera lucida) to project the small sketch onto the paper or drawing board.

Here the ever-present problem of cost enters the picture. Photostats (the most effective method of working up your final drawing) tend to be prohibitively expensive for an illustration of 18" by 24" or larger and an acceptable artist's "lucy" will cost at least fifty dollars. The deluxe professional models with enlargement and reduction scales (similar to a

graphic arts camera) can cost as much as five hundred dollars. For a commercial studio they are the only feasible answer to the requirements of adjusting the different elements of a picture or layout into a balanced and pleasing composition in a minimum time, a vital factor in a commercial studio, where each minute must be charged up either to profit or loss.

Our particular need, however, is a modest (and cheaply made) projector which will enlarge small clippings or photos so that they can be easily traced. Figure 2 is a diagrammatic sketch of a projector which can be easily made by the average tinkerer; one which will enlarge small (3.5" square) pictures or drawings to several times the original size. It has the added advantage over the usual overhead or 'postcard' type of opaque projector in that it employs the principle of back projection...the tracing paper, when taped down on the glass platen, acts as the ground glass on a camera. This simply means that the tracing is done without interference from the shadow from one's own hand inevitably encountered when other means of projection are utilized.

The main expense will be the Magnajector opaque projector (available from Edmund Scientific Company, or from local variety or art stores for approximately \$7.00. The lens tube must be modified with an extension tube to permit the lens to be moved farther out from the projector, as it was originally designed to throw wall-sized pictures over a short distance. An additional two inches of lens extension should be adequate. Also, be sure to install double-thick glass, or preferably, a piece of plate glass, in the platen frame if you have a heavy hand on the pencil!

The projector base (which raises it so that the optical center of the lens is in line with the center

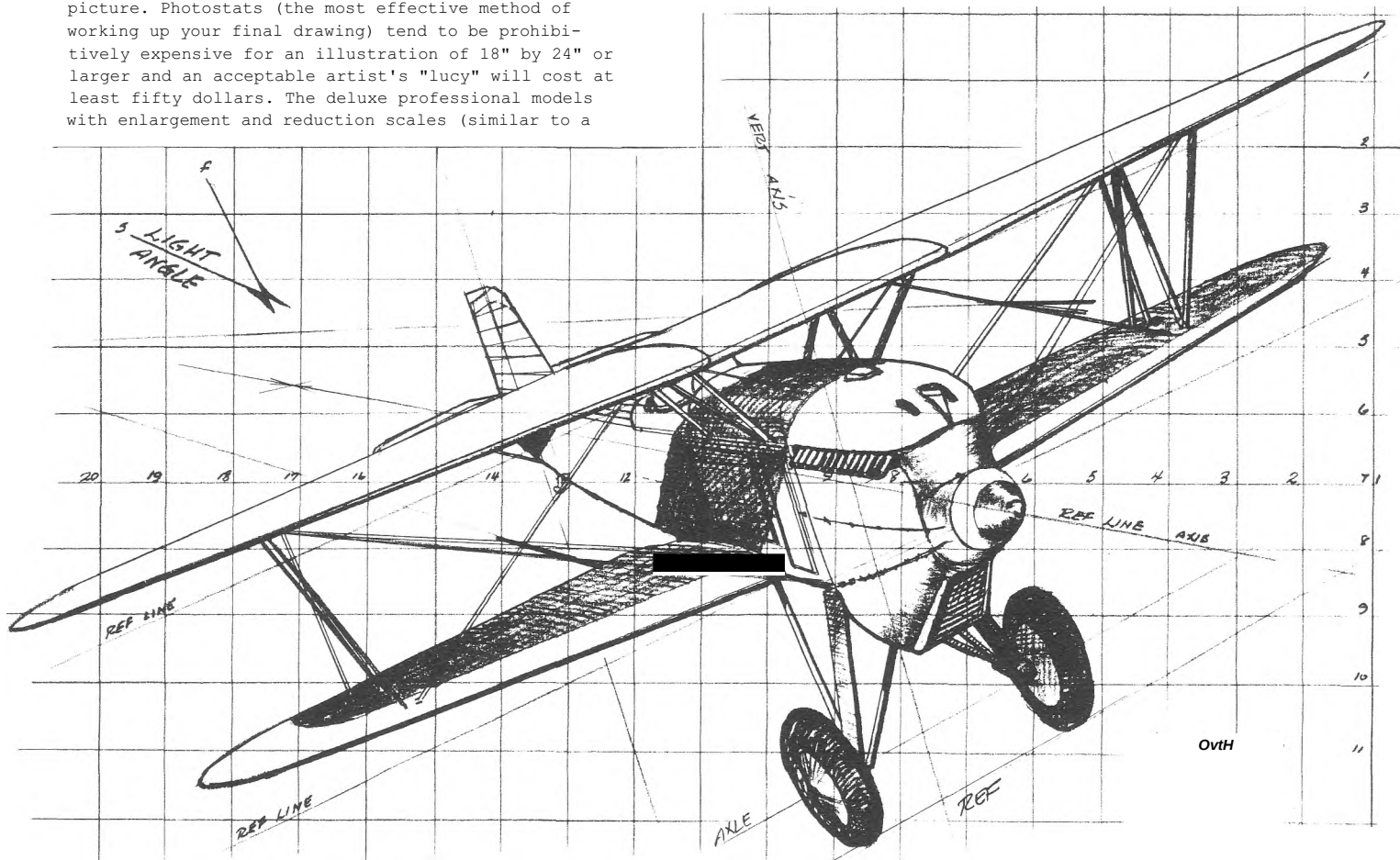


FIGURE 1. - Although not as finished as the picture on the preceding page, this Curtiss "Hawk" P-1B represents an enlarged rough sketch, worked up by the composition line and squaring-up method. It is essentially a free-

hand drawing right from the start. No tracing from a previous drawing or photo was employed. The tail and rudder still does not seem to be quite "in drawing" and must be reworked before the sketch can be used.

glass platen) can fitted with a crank and pulley arrangement to permit rough focusing from the operators position. Eager home mechanics can go

even farther and possibly work out a system of rack and pinion to advance or retract the lens itself to permit finer focussing and sizing of the image of the tracing paper.

Naturally, these mechanical means of getting a tracing of the main elements of your picture will help; but the real work is yet to come. Suppose that you are making a drawing of an airplane which is intended to show the internal structure and powerplant installation such as shown in the MB-3 cutaway. This was developed from a very small halftone clipping. Inasmuch as it was a side view, single-point perspective was used to work up a refined, precise drawing, and the structure, plus equipment, was laid in by eye working from structural drawings of the various components of the aircraft that were supplied by the Air Force Museum.

The cutaway of the Thomas-Morse TM-22 racer was also developed from a photograph as shown; however, here a two-point perspective was necessary as the aircraft is a three-quarter front view. Disappearing points were located by drawing lines along the leading and trailing edges of the wings, allowing for dihedral; and casting a center line through the fuselage.

Casting out a true perspective from three-view drawings can be a very tricky procedure, although to trained artists it can provide a perfect check on the position of wing and stabilizer tips, strut attach points, and other knotty problems of layout on your picture. However, many true perspectives do not look altogether perfect to the eye, and a certain amount of "fudging" may be necessary in order to readjust landing gear legs, struts, and other parts of the aircraft so that they "Follow" the lines of the aircraft to make a better picture to the eye. You can prove this point by taking a photograph of any airplane and casting out the lines along the leading and trailing edges of the wings, the center line of the fuselage, and other easily discernible angular edges of the structure to their common disappearing point. You will find that there is considerable disparity in these lines- that is, the lines that you would expect to coincide at the disappearing point do not do so exactly. The camera has a habit of distorting parallel lines, depending largely on the focal length of the camera lens- a fact which photographers have learned to use to their own advantages. In the next article we will present some diagrams to show how to lay out a pictorial drawing from a three-view, or orthographic aircraft general arrangement, and how to

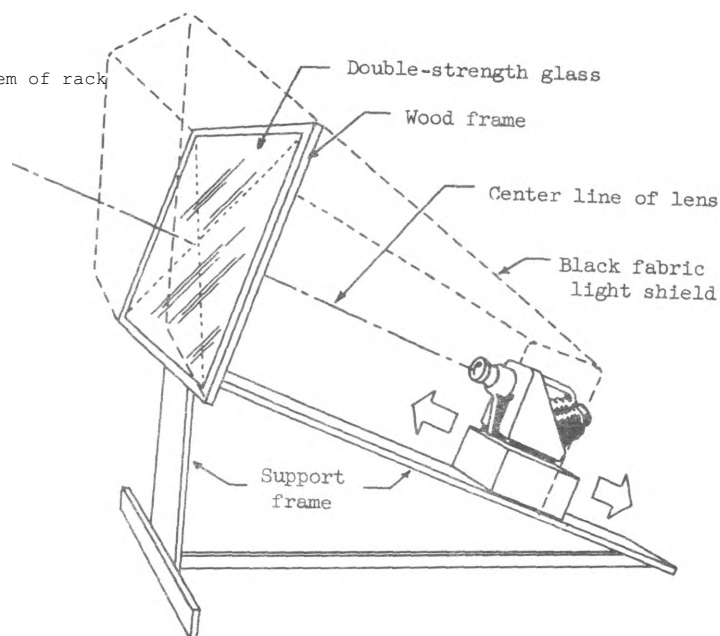


FIGURE 2 - OPAQUE PROJECTOR ARRANGEMENT

take advantage of "adjusting" certain parts to create an effect of speed or movement, which provides the impression of action instead of merely representing a static ob-

If there seems to be a great deal of emphasis on the use of photographs as either source material, either by

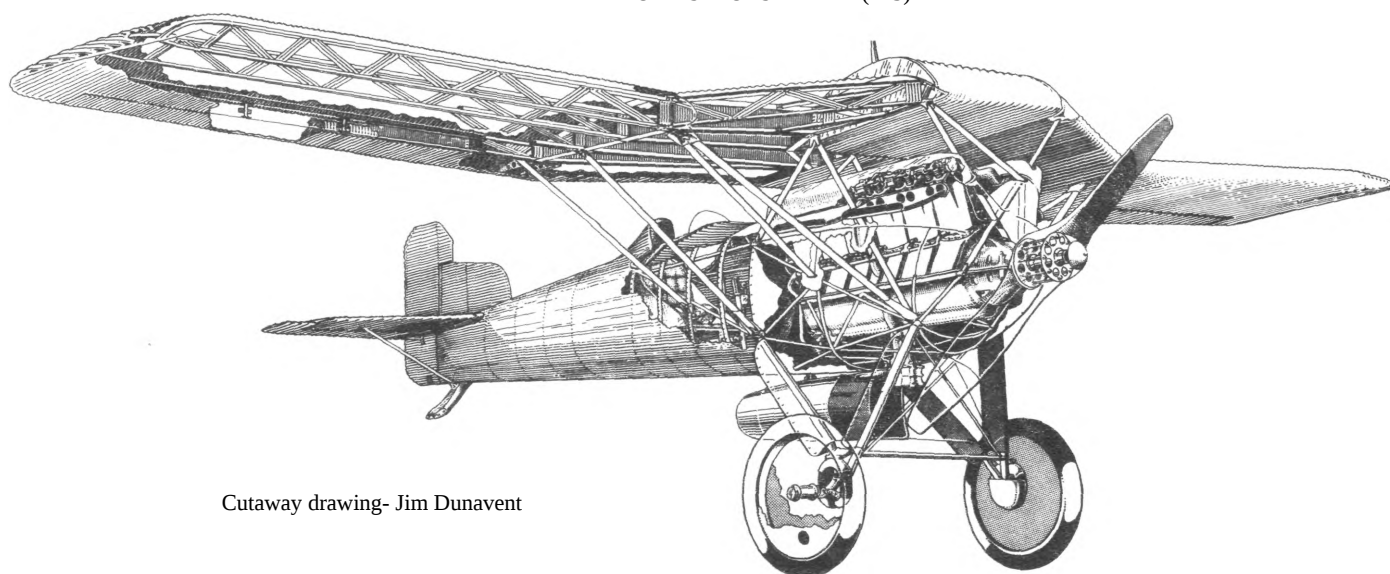
tracing for reference, it is because they represent the only way to obtain the character of the aircraft involved, as the majority of the types in which we are in-

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It is a good idea to make several style- of your ideas and then to check them with your photographic source material before progressing further. Cast out the parallel lines to the right and left hand disappearing points to assure that your sketch will "stand up"... that the aircraft seems

Plane, add rough indications of the background selected, and you are ready to enlarge it to working size for further refinement and addition of details before starting to shade or add color.

THOMAS-MORSE TM-22 (R-5)



Cutaway drawing- Jim Dunavent