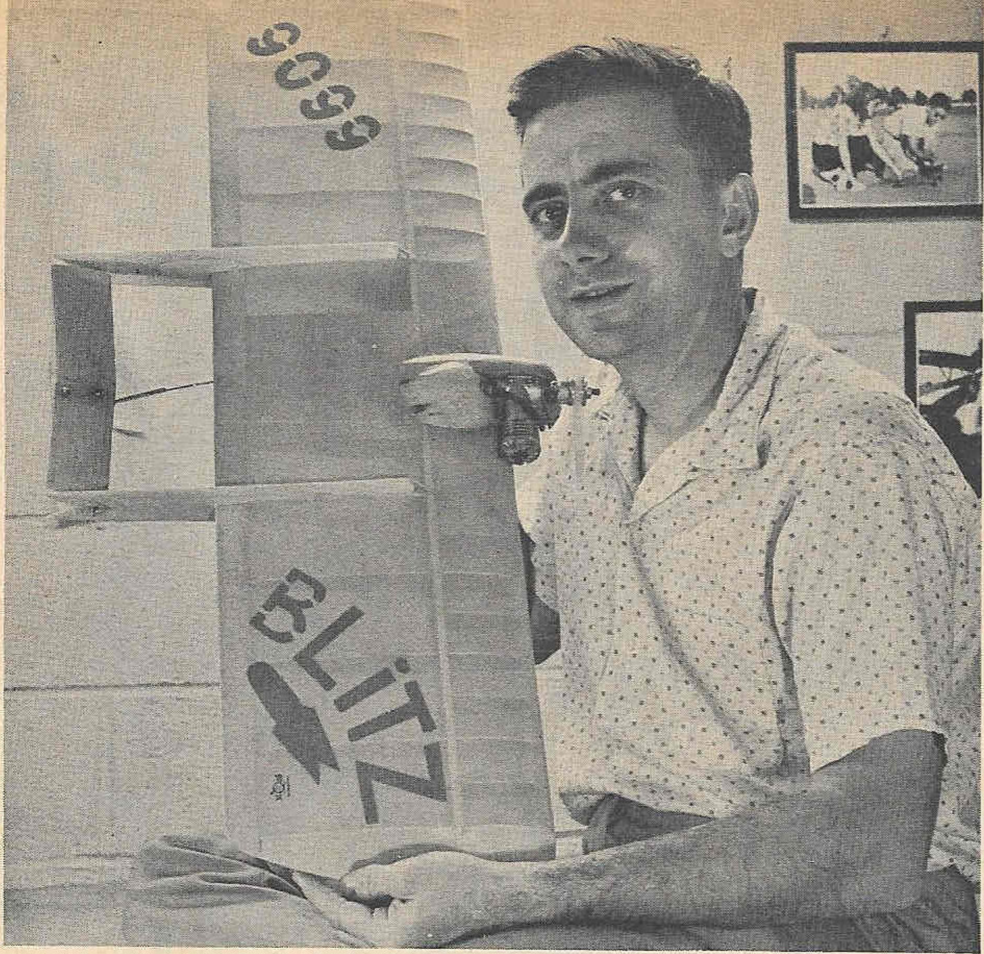
BLITZ!

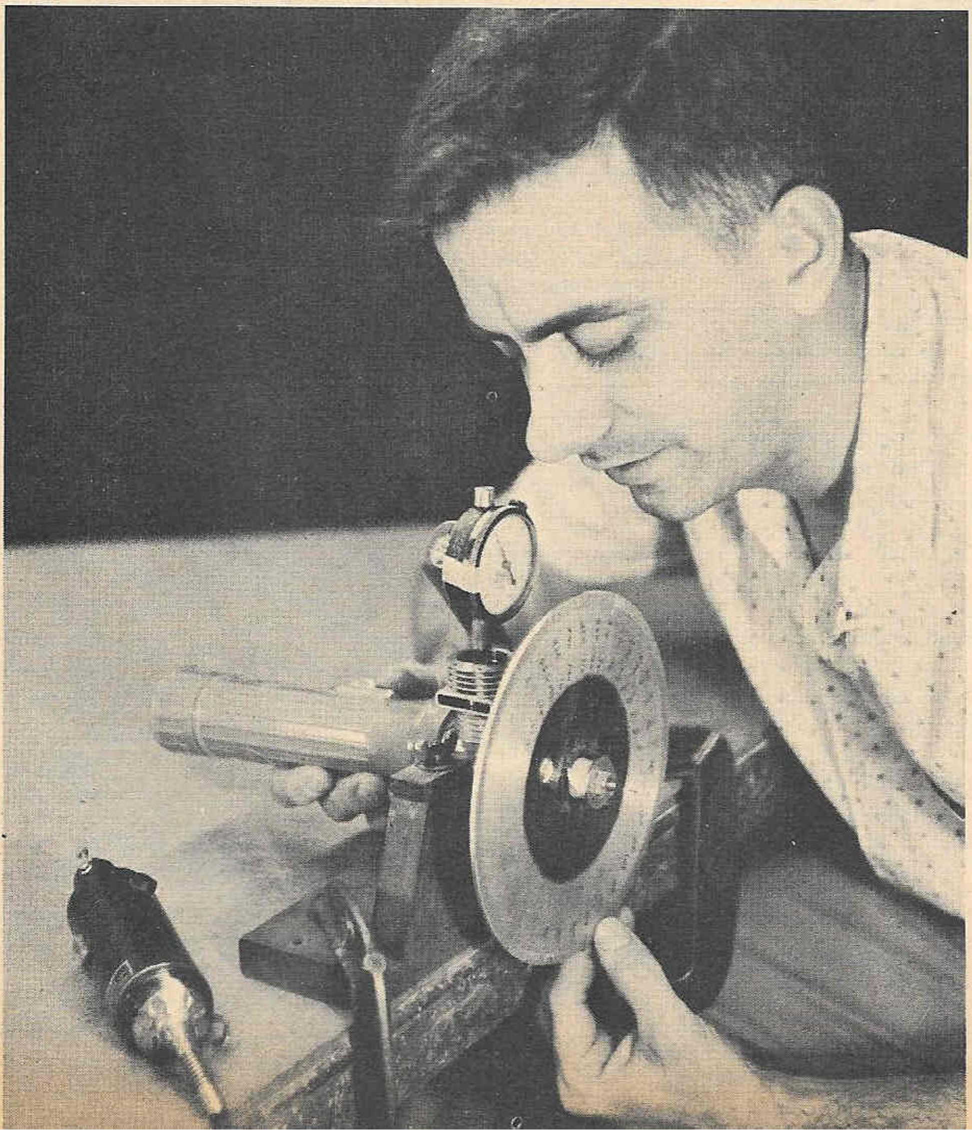
by LARRY SCARINZI

FASTER THAN FAST COMBAT-PRIME OBJECT FOR OUR SUPER-SPEED RIBBON CHOPPER! BONUS WITH THIS ONE AS FULL DETAILS FOR BLITZING WITH BLAST FUEL.



Didn't know that Larry ever had a peaceful moment but here he is fully relaxed with his prop shedding and engine blasting Blitz. Light weight plus high rpms is secret of its success.

Using timing wheel and dial indicator to check port timing. Timing wheel is attached to crank-shaft and indicates time cycle; dial indicator is used to show when piston at top dead center.



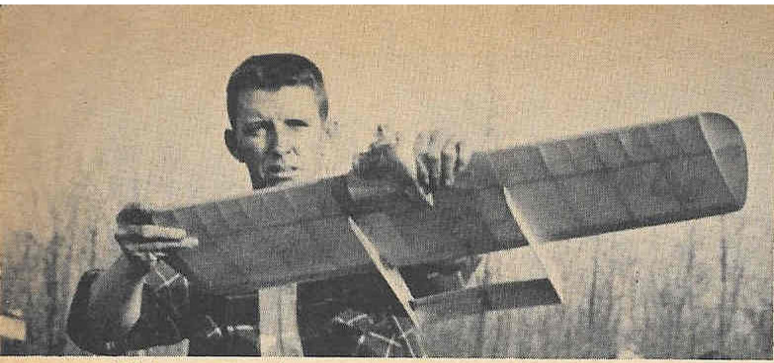
We have now entered the era of 120 mph combat models, high nitro fuels and rpms out of this world. High speed and tight turning capability are certainly a measure of performance in a combat model.

It was the ride home from the Chicago Nats with "Boltin" Bill Ledden that sparked the series of Blitz test models. Discussion centered around a light streamlined craft that could utilize the higher rpm's available in present day nitro burners. It was agreed that the most successful combatter would be a "marriage" of a lightweight, well-designed model, properly tuned engine and fuel system that would act as one unit.

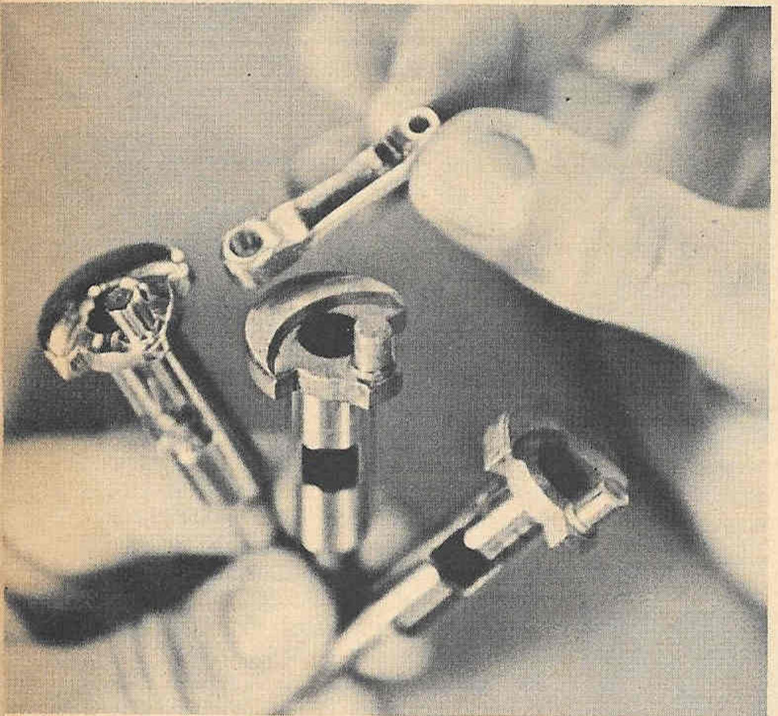
Several test vehicles were built to evaluate long and short moments, rudder area distribution, fuel systems and airfoil thickness. Early in 1963 the single needle bearing Fox .35X outshone the preceding combat special in some areas. Blast fuel was introduced and showed its effectiveness quite early. Between engine tuning and higher nitro fuels, we were now well into the era of development where we could literally "Blast" engines apart just about at will, and this was not confined to the jewels of any one manufacturer. The Blitz was now doing 115 mph whenever we were willing to risk higher nitro fuels. Structural limitations in the .35X shaft were now evident and proved to be our next barrier. A plea went out to Duke Fox to supply a new shaft filleted as to eliminate a stress concentration in the crank-pin area. Along with this as a "softening up" factor went a claim that such a shaft would surely allow us to Blast over 120 mph!

After careful study the final Blitz was planned. Still contending with the crank-shaft barrier, this model consistently flew over 114 mph with low nitro fuels. Finally Duke came through with what is now well known as the stroaker shaft.

The first Blitz with a .36X engine was assembled and ready for test. Would it do the predicted 120 mph? Was Duke's new *(Continued on next page)*



Bill James, Fox sales manager, prepares to launch Blast burning Blitz. Bill's a top combat man, follows contest circuit, was third at '63 Nats.



Crankshaft and connecting rod rework. Stroaker shaft is the polished unit. Note the contours described in text, rod lightened and polished.

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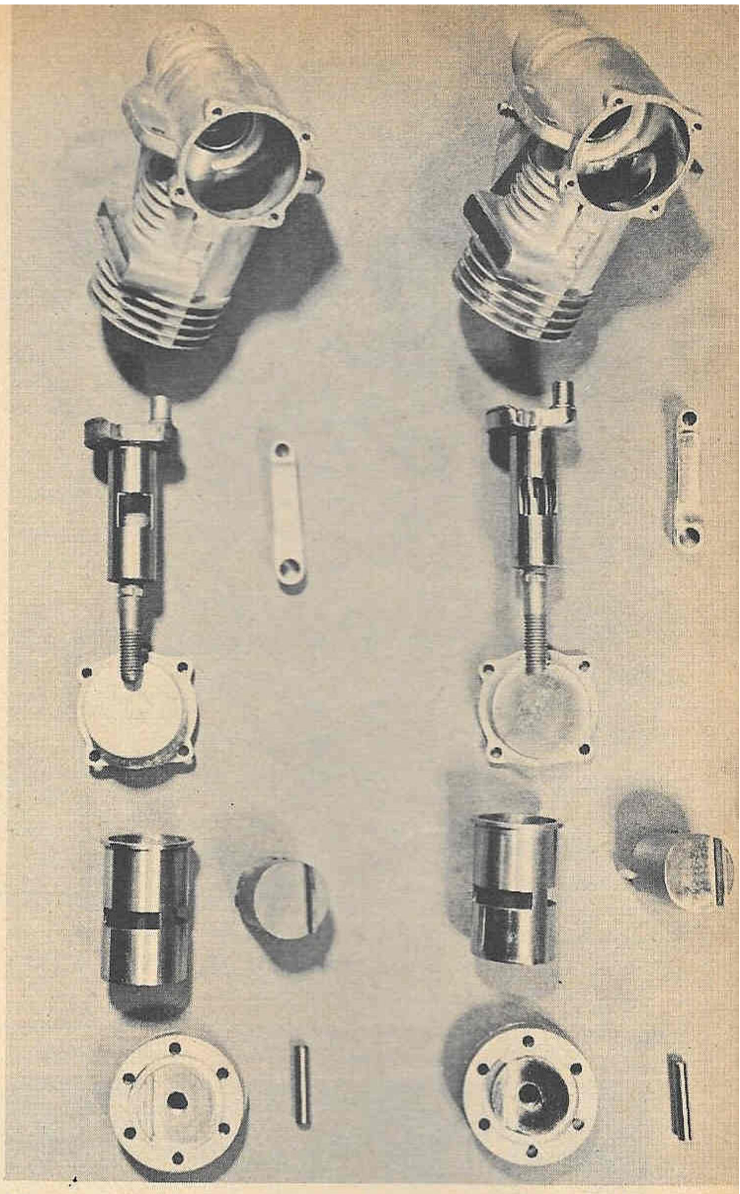
shaft really Blast-Proof?

Flying began with straight Missile Mist fuel and a speed of 112 mph. Blast was blended with Missile Mist in increasing amounts until, at 60% Blast, the Blitz bettered 120 mph. Earlier claims were now fulfilled.

We must have set some kind of a record for engines blown up during the Blitz development period and we learned a lot from the collection of engines that "Boltin" Bill *had* (before Blast). Don't be alarmed as this is to be expected when engines are pushed beyond their design intent.

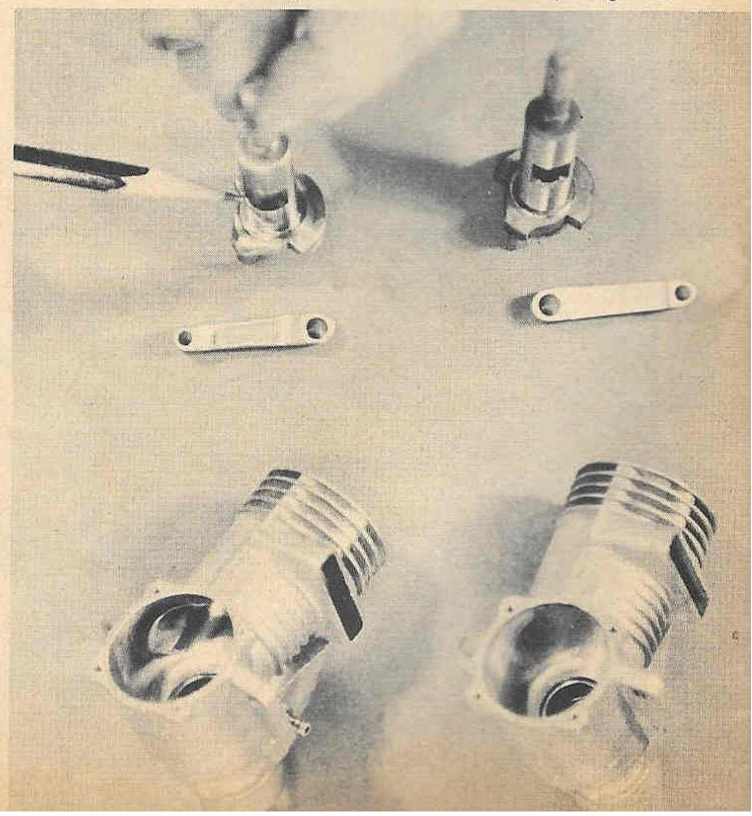
In August the family and me just happened by the Fox factory. Walked into Duke's office carrying a carton labeled, Blown-up Fox's. A record heat wave of 106° afforded us with an excellent opportunity for high nitro tests in hot weather. Besides, a Confederate Army officer couldn't keep Bill James (3rd—Nats combat winner) from pumping Blast into *my engines!* I was surprised at how well the engines performed in the 106° weather. Although ground settings had to be somewhat richer, performance proved consistent as the new Blitz was Blasted over 120 mph the first time up.

Time was spent improving on the reliability of our system. The month of October was blessed with over 120 flights. Of equal importance is the fact that only one engine suffered any damage between August and the end of November, 1963. To date the (*Continued on page* 32)



Before and after! Engine at left is before rework; note radius at base of cylinder sleeve is to the outside only, some difference in shaft intake.

Crankshaft and crankcase before and after. Crankshaft show contours as well as radius honed into edge of the crankcase intake porting hole.



Blitz!

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final Blitz has not had a flight where it failed to hit at least 110 mph. Legitimate line lengths and diameters were used for all flying.

No. 8-8 props were used for all 120 + flights. Many thin blade wood speed props will fly apart in the air at speeds of 117-122 mph. Wider blade nylon 8-8 props seem a little safer and will generally withstand speeds of 121 but will be very dangerous at around 124-126 mph. We sincerely *BEG* all who try our methods to use extreme caution when operating at high rpms. *NEVER* stand over a prop when adjusting a needle valve.

I can sense the combat enthusiast groaning that an 8-8 won't tug a streamer. Wince a little and try a Tornado nylon 8-8 on a pacifier-Blitz.

Present barriers to higher speed include the need for: (1) a good 8-8 prop that won't fly apart and (2) a glow plug with seal and element that will hold up under high nitro fuels.

Let's get into some of the features of the model itself. Sliding the motor into the wing is a little more work but it is well worth the performance rewards.

Large vane like rudders were employed and they were *offset* for *less drag*. A zero-zero set up is fine when flying alone. In combat you will be forced to maneuver in awkward areas of the circle with respect to wind direction. Now you need a correcting force to assure line tension. To accomplish this the lead-outs and CG location are trimmed so the Blitz wing is flying pointed slightly *away* from tangent to the circle. To put the rudders in a path tangent to the flight circle, they must be *offset*. As in stunt, rudder design is important in combat. Crosswind maneuvers will bear out the effectiveness of the Blitz rudder design.

The pacifier fuel system is a must for top performance. This gives the steadiest engine run that I've ever seen and will outlast pen bladders many times over. When building the pod, coat the insides with a fuel-proof medium such as white glue. Sand smooth to keep sharp edges from piercing the pacifier. Be sure pod will clear a 2⅜ diameter sphere (use a rubber ball as a guide) without interference. If the pod is small and restricts the pacifier when inflated you will *NOT GET* the best of motor runs. Pod shown will hold four ounces of fuel.

The airfoiled and balanced stabilator works in conjunction with the fence effect of the rudders directing the airstream and restricting it from spilling over the ends of the stabilator. This results in a very snappy control response. A proper trimmed Blitz will turn outside loops from a level flight altitude of 20 or 30° without loss of speed. Practice quick wrist movement and learn to use these advantages.

CG location and control sensitivity are set up to suit my own "feel." This relationship is important and should be trimmed to suit the individual. Beginners are advised to move the CG ¼" foreward.

The original Blitz weighed in at 14½ ozs. complete with engine. Choose wood wisely, particularly in the tail end. Use white glue to construct the center section.

Unless the builder is an expert, adhere strictly to the plans as any deviation can hurt performance. Construct the basic wing, add the ¼ x ⅜ L.E. reinforcement and then cut out the leading edge section. Build mount assembly of F-1 and motor mounts. Cut outside root rib on dotted line indicated and slip mount assembly into place. Install controls, sheeting, and motor pad. Construct fuel pod and finish the wing. The novice may prefer to use the tin tank version. Fiberglass and resin coat the motor pod, fuel pod and leading edge break area. Silk cover the wing applying enough dope to shrink the silk *tight*. Apply an excess of dope over the leading edge area. *Tight smooth silk is important if high speeds are to be realized.*

If you prefer, the stabilator may be built. Join the finished rudders and stab. to the wing noting rudder offset. Cut through and install the 1/32" ply rudder tie down pieces using white glue. This is important if you want the tail to stay with the wings during violent 120+ maneuvers.

The outwardly light structure will take more of a pounding than is apparent. There is a good engineering reason regarding inertia that explains this.

Part of the definition of inertia tell us that matter has the property of staying in motion unless acted on by some external force. When a model crashes every component in it tends to keep going. The heavier these components are the greater their inertia. If the structural members supporting the component are not strong enough to resist this greater inertia we will have a structural failure. Let's apply this to "crash resistant" model design. Upon impact the stabilator tends to keep going. The force resisting the inertia of the stabilator is transmitted through the two rudders. The heavier the stabilator (assuming speed constant) the greater the inertia and the more force required to stop it. Structural failure in the rudders will occur if they are not sufficiently strong to apply the force needed to "hold back" the stabilator.

THE BLITZ-.36X ENGINE:

It's "What's up front that counts." Reworking an engine allows you to coax the most out of your production power plant. Our rework concentrates on timing, cleaning, reducing internal friction and careful bind-free assembly. The reliability of reworked engine-after-engine must be seen to be appreciated. This reliability stands as a real tribute to the American manufacturer. If you can and do not work with extreme care leave your engine alone, as it is easy to do more harm than good.

The following applies directly to the single needle bearing Fox .35X. Disassemble the engine. Stuff a piece of oil-soaked cloth into the needle bearing to keep filings out. Carefully scrape burrs off base of venturi. Note that this effects shaft timing. With a jeweler's file, lengthen the oil grove running down the shaft bearing to 3/32" from the front edge of the case. Then run a few fine scratches all the way out the front end of the case. This will allow some lubricant to leak through. This modification is a "must" if you are going to operate at the higher rpms. The extra lubricant will prevent galling in the front end. To date I have not had an aluminum front end wear out.

Remove the casting burr at the base of the bypass. Polish case, bypass and back cover.

Crankshaft work is perhaps the most rewarding area of rework. If you do not have a stroaker shaft I advise obtaining one, a .026" head spacer and new stronger wrist pin from Fox Mfg. The stroaker shaft is identified by the large fillets on both sides of the crankpin web. This shaft has proven Blastproof. The stronger wrist pin does not have brass pads. The last .35X's sold in 1963 had stroaker shafts. The 1964 model will be identified as the 36X and will come equipped with all Blast-proof components described. (We made 5/32" dowel pins into wrist pins for our early tests.)

Shaft port timing plays an important

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part in the performance of your engine. As the shaft port closes later, you have a higher rpm-lower torque condition. Limiting factors here are crankcase pressure build up versus inertia of fuel droplets trying to get in. Limit of closing time on the 36X before rpms drop off is around 62°ATDC (Ref; piston at top dead center, *not* crankpin). Shaft opening time is not as critical as closing time. Stock shaft opening and closing time (before de-burning venturi) is 138° BTDC and 50½° ATDC respectively. I recommend setting the opening time at 147° BTDC and the closing time at 59° ATDC.

Time shaft by setting engine (head and back cover removed) in test stand (see photo). A radius wheel must be mounted on the crankshaft of the engine with a reference pointer set up somewhere off the circumference of this radus wheel. This pointer may be formed from a piece of tin and screwed to the workbench or test stand. It is used as a reference when reading degrees difference from piston at top dead center to the point where the shaft port opens or closes. It should be located pointing to 0° on the radius wheel when the piston is at top dead center.

A radius wheel may be fabricated from two protractors. Drill out protractors to fit over the ¼" crankshaft. Drill at the reference center of the protractor (point that falls over the vertex when measuring an angle). The two protractors must now be set up to form a complete circle with the ¼" hole in the center of this circle and the 0° mark on one falling over the 180° mark on the other. Glue or screw these together and mount this assembly on the crankshaft of the motor.

Several methods may be used to find top dead center. One method entails using your thumb nail. While rotating the crankshaft slowly, place your thumb nail on the piston baffle with pressure and you will physically "feel" top dead center as the point where the piston is at its highest position. If this method is used, practice it several times and check repeatability of your readings. A more sophisticated method entails mounting a dial indicator above the piston with its plunger in contact with the top of the piston. The point where the indicator needle changes directions when the shaft is being rotated represents top dead center. A depth micrometer may be used in a similar manner.

Once you have found top dead center, turn the radius wheel 59° in a counter clockwise direction to mark a shaft closing time of 59° A.T.D.C. Mark shaft along closing side of venturi by inserting a sharp scriber into the venturi, (Suggest you allow about 3° on this for a practice run. As, mark shaft 56° A.T.D.C., grind port hole to this line and then re-assemble in test fixture to check your work.) Repeat this for the opening side and then remove the engine from the test fixture.

Grind shaft to marked lines, lengthen port to match the front edge of the venturi, contour edges of port hole, polish bore of shaft and round out shaft exit hole. Round off area behind crankpin and polish face of counterweight. Polish crankpin and O.D. with crocus cloth. Shaft may be chucked in a ¼" drill to polish O.D.

Check timing. By shining a flashlight into the back of the crankcase, you can look down the venturi and tell exactly when the port opens and closes as the time when the beam of light breaks.

Cylinder port location effects torque, rpm and fuel draw. Ports are now located in a happy compromise position for combat use. Leave them exactly as they are.

Radius the cylinder skirt at bottom of cylinder sleeve and polish this area up to bottom of intake port. De-burr ports and file all sharp inside edges with a fine stone. Be particularly careful on the top edge of the intake and exhaust port. This is important as the piston could hang up on a sharp port and score. If properly de-burred and fitted, a piston should be able to run wild (as when a prop flies apart) with no damage.

File piston baffle down to .160" in height if you are willing to run Blast or other high nitro fuels of 50% or more. Do *not* do this if you are going to run low nitro fuels as it will cost you rpm. Suggest a baffle height of .170" for Missile Mist or 25% nitro fuels and .180" for Superfuel or 5% nitro fuels.

Attempts to lighten the piston are discouraged as it wouldn't take much to weaken it to the point of distorting under operating conditions. Polish top of piston and head. Lap piston carefully to the cylinder, using a mixture of rotten stone (available at hardware stores) and oil to the point where it will bubble gasoline by the piston. Advise lapping part way and running several times as the heating and cooling cycles will help to relieve internal stresses. Then lap a little more to final fit. It is the fit of parts *at operating temperatures* that is important. Don't worry if it leaks compression slightly after lapping. With practice you will develop a feel for a proper piston fit.

Round off all sharp edges on the connecting rod and polish. Polish wrist pin to a smooth slide fit in the piston and rod. Fit the rod to the crankpin with .002" or .003" clearance. This is a free fit.

Compression is set-up by adding .010" thick Fox or removing head gaskets until the piston just clears the head and then adding one more to give .010"+ piston-head clearance. A .026" Fox head spacer works well.

Proper assembly is important. Assemble the engine dry. With the head and backplate removed, be sure the engine will turn over freely.

Tighten head screws down slowly checking for binds as you go. If you have trouble getting the head tightened free of cylinder binds, remove head and liner. Look at the top edge of the case bore for black interference marks indicating that the top edge of the case bore has been pushed into the cylinder liner when tightening the head. Sand or scrape this area and clean out screw threads. To assure proper seating lap the cylinder flange to the top face of the crankcase. Another possible cause of binds is when screw holes in the head do not line up exactly with the case and push the head sideways on the cylinder flange.

Oil engine and run about four tanks at a fast four cycle on low nitro-high oil content fuel before flying. You should now have a motor that is virtually "Blastproof."

WEIGHT OF WOOD USED IN BLITZ IV
Model wt. complete = 14½ ozs.

Item	Wood Thickness	Type Wood Balsa	Wt./Sheet; Grams 3"x36" Sheet
Ribs	1/16"	Contest, Picked "C" Gr.	11.2 grams
"	3/32"	"C" Grain	17.1 "
Half Ribs	1/16"	Contest, Picked "C" Gr.	8.4 "
Trailing Edge	1/16"	"C" Grain	15.5 "
Center Sheeting	1/16"	A-B Cut	13.0 "
Wing Tips	⅛"	"C" Grain	25.0 "
Rudders	⅛"	Contest, Picked "C" Gr.	21.2 "
Stabilator	¼"	"B" Cut	31.7 "
Rudder Reinf.	⅛"	Firm "C" Grain	36.0 "

Rel. humidity at time of weighing = **15%**. (A 1/16" sheet that weighed **12.1** gr. at 15% humidity will weigh approx. **12.7** gr. @ 55% humidity.)

Weight of two ⅛"x¼" spruce spars = **16.2** gr. total.

Weight of model prior to fiberglas = **119.25** gr. = **4.2** oz.

Weight of model after fiberglass = **133.5** gr.