



Shortly after receiving my 1968 copy of the official AMA rules, it occurred to me that the provisional 600 square inch Goodyear event could do for miniature pylon racing what the Bikini did for the beaches. Here, I thought, is an event that is well suited for everyone; an event that can provide all the thrills of scale goodyear racing with much less risk to models, equipment, and spectators. I began to mull over in my mind the virtues that a racer in this class should have. First and foremost, of course, is speed; it has to be fast, but it also should be of simplified construction to keep the builders investment of time to a minimum. It should be docile and easy to pilot, with none of the common undesirable tendencies, such as pitch instability and wing tip stalling during high speed turns and low speed approaches. It should be rugged enough for sport flying from the roughest flying fields, yet light enough not to be handicapped while racing. And, finally, it should be esthetically pleasing and scale-like in appearance. Design parameters having been formulated, I began to consider specific methods of achieving them. Current high performance stunt ships, it was felt, offer most of what is needed in the way of size, flying ability, simplified construction, and for the most part, good looks, so extreme deviation seemed unnecessary. Further, since it is generally agreed by most experts that low wing designs offer the least air flow disturbance created by the junction of wing and fuselage with subsequent reduction of drag, it was decided to follow convention and place the wing on the bottom of the fuselage. Additionally, low wingers offer ease of construction, as compared to mid-wingers, and they need only a lightweight minimal landing gear.

Armed with this earth shaking decision, plus the mandatory criteria established by the rule book, I began sketching various layouts running the gamut from designs that resembled P-51's and Spitfires right up through the F-111 and Bomarc missile! After much doodling, I finally hit upon Pokey, a layout that instantly appealed to me, and which seemed to fill the bill as far as previously established parameters were concerned. A Pokey was hastily built and flown, which unconditionally confirmed my suspicion that this was, indeed, the answer. Pokey met all the original criteria with performance to spare. She is as easy to build as any multi-ship, is lightweight, (the original weighs only 4 lbs. 10 ozs. ready to fly, minus fuel), is quite rugged, and handles very much like any hot stunt ship. In fact all of the positive 'G' FAI

# POKEY

HERE'S A CONTINENTAL  
CLASS RACER THAT FEATURES  
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YOU IN THE WINNER'S CIRCLE.

by MAJOR FRANK JEPSON, USAF

maneuvers have been performed with her and she literally breezes through them. I have steered away from attempting negative 'G' and snap maneuvers, at least until the current racing season ends. One of her outstanding virtues is her ability to do knife edge flight. Roll to the 90° bank point, hold top rudder, and Pokey will actually climb in knife edge. She has undoubtedly the finest knife edge characteristics I have ever witnessed. Alright, you say, she sounds okay from a sport flying viewpoint, but will she win races? Pokey is FAST—how fast I can't say yet because she hasn't been raced due to the seasonal contest calendar in my area, but I can say that if she doesn't win all her races, the cause will more than likely be the pilot! Pokey is considerably faster than my own .60 powered stunter and breezes by all comers at the local flying field, I am confident that she is a potential winner. The coming season will tell as there are many continental class races scheduled.

A few general observations about the design may be in order at this point. Notice that the wing section is not as thin as that seen on many of the 450 square inch racers. It was felt that reducing the wing thickness to less than 11% would actually increase total drag since total drag equals induced drag plus parasitic drag. A thinner section would admittedly reduce parasitic drag simply because there is less area to pull through the air, but in reduced drag would sky-rocket. This is drag caused by the additional angle of attack required by a thinner section to hold 4½ lbs. in straight and level flight.

The thicker section also makes for a stronger, more warp-free structure. The section used is 11.1% thick at the root, progressing to 11.8% thick at the tip. The theory here is to insure that, if there is to be any stalling done, it is to be done at the root first, resulting in a pitch-buffet stall warning rather than the usually disastrous snap roll caused by the unannounced stall of one wing tip.

Take a look now at the odd shaped wingtip. This is called a spoon tip and may currently be seen cropping up on some of the newer full-scale aircraft. The idea behind this tip shape is the reduction of lift killing wing tip vortices. It does this by accelerating the air spilling from the wing bottom in an outward direction, keeping it from rolling in over the top of the wing, thereby spoiling lift, causing increased angles of attack to maintain level flight and increasing induced drag. This type of tip is ideal for Goodyear racers, but I don't recom-

mend that you try it on your next stunter since, during all negative 'G' maneuvers, the tip will work in reverse, accelerating tip vortices inward.

The next item of interest is the zero-zero thrust, incidence set-up, coupled with symmetrical airfoil sections. Some experts will tell you that you just cannot fly that way, but Pokey shoots that theory down. Pokey's elevator is trimmed flat when in straight and level flight. I concede that there has to be some slight up-elevator trim action but it is undetectable with the naked eye. What this force-incidence arrangement does provide is absolute neutral stability in the pitch axis within the confines of engine power available. In short, it means that the airplane goes exactly where you point it, whether straight up, straight down, or straight ahead, as long as sufficient power is available. Pokey vividly demonstrated this to me on her maiden flight when I pulled her up in a giant sized loop. As she reached the inverted point, I relaxed back pressure on the stick as I customarily do and Pokey continued flying straight and level inverted without the slightest need for down elevator. Of course there are further complicating factors which account for this phenomena, but a discussion of these is not considered within the purview of this article.

Another interesting feature is the method used to mount the wheel pants. The pants are friction loaded to the axle and are free to rotate on the axle in the event of a nose-up. The idea is an adaptation of the friction wheel brakes that were popular a few years back. They may be slightly more difficult to mount than some other types, but the promise of damage prevention makes the extra effort worth-while.

Some of you sharpies may have noticed in the photos that the exhaust port on the K & B 40 has been turned to exit on the starboard side. This is a nice feature of this engine and doesn't seem to effect performance at all. It is accomplished merely by bolting the front of the engine to the back and moving the back plate to what was the front. By adding an exhaust baffle from the Super Tigre line, which incidentally is a perfect fit, we now have a racing engine that idles with the best of the standard RC engines. Credit H. Debolt as the first reporter of this improvement. At any rate, I can testify that it really works. Proto takeoffs and touch and go landings, without fear of dying, are routine with Pokey.

If you are enthused enough to want to build a Pokey, consider this while you are dusting off your work bench:

selection of wood is *extremely* important. Use *only* light to medium balsa unless other types of wood are called for. I can't vouch for a 6 lb. Pokey, but I am sure it would be extremely detrimental to performance. If you are an unavoidably heavy builder, then forget it and go buy a Lanier Midget. Pokey was designed to fly and to race. Resist the urge to beef this up and beef that up. Keep the final weight to under 5 lbs. and you will be more than pleased by her; go over that, you are on your own. Decide now how you want to mount your engine. I chose the upright position for accessibility and cooling, but a side mounted, or inverted, installation would enhance her appearance and be just as easy to make.

## CONSTRUCTION NOTES

### WING:

Start construction with the wing. The prototype was built on the R.C.M. wing jig. If you have not read the article or your memory of it is cloudy, I suggest you dig out an August '67 issue and turn to page 24. The use of the jig is particularly beneficial for this type of wing and will speed construction considerably as well as insure straightness. Since the airfoil on Pokey is considerably thinner than that illustrated in the original article, a slightly different procedure for cutting ribs is recommended. The first step is to cut templates from aluminum or plywood for the root rib and the tip rib. Drill two 3/8" holes in each, in the location shown. From soft 3/32" sheet cut 20 rib blanks 1-1/4" x 10" and cut two from 1/8" sheet. Using the root rib template as a guide, drill two 3/8" holes in each rib blank. You can drill three or four at a time. Sandwich ten 3/32" and one 1/8" rib blanks between the two templates. The 1/8" blank goes next to the root template. Use two 3" lengths of 3/8" aluminum rod to line up the holes in all rib blanks. Clamp the stack in a vise and using a plane or rasp, remove all wood not covered by a template. Sandpaper the stacks to a smooth finish, make the 3/16" square spar notches, and one set of ribs is complete and ready to install on the jig. Repeat the process for the other wing half. You will notice, particularly at the leading and trailing edge locations, that because of the way the ribs were cut, they meet the leading and trailing edge at an odd angle. This does no harm and may strengthen the wing if the angled gap is filleted with cement. The balance of the wing construction is completed exactly as described in the previous article.



#### FUSELAGE:

Cut the fuselage sides from medium 1/8" x 4" x 48" sheet. Check the fit of the wing saddle for each side in its approximate location on the wing. Any adjustment needed should be made now while it is still easy to accomplish. Double the sides with 1/16" sheet from F-2 to F-4 with the grain running vertically. Use polyester resin as an adhesive for the doublers because of its superior penetration, its ability to cure quickly without air, and its sandability. Anyone who recommends contact cement for this chore has never sanded a corner through to the glue. Contact cement just WILL NOT SAND. It balls up wrecks havoc with finishes. While the doublers are curing, install the stringers and elevator doubler using Titebond glue. Cut out F-1 through F-4. Make your engine radial mounting plate, drill corresponding holes in F-2, observing the thrust line, and set the blind mounting nuts. Mount the engine to F-2 and drill holes for the flue line, the vent line, and the throttle cable. I used brass cable in nylon tubing for the throttle, but snakes would work equally as well. When the sides and doublers have cured, join them squarely using F-3 and F-4. Allow sufficient time to dry, then pull the tail section together and glue. Now install F-2 with the engine still attached. Slip F-1 over the engine shaft, then install the prop and spinner on the engine. The purpose

here is to insure that the front of the fuselage fairs properly with the spinner. Allow a 1/16" to 3/32" gap between the spinner and F-1. Adjust fuselage sides and F-1 to secure proper alignment, then glue. When this assembly has dried, remove the spinner and engine. Add all remaining doublers, 1/2" triangle stock, T. E. stock, blocks, and sheets in the conventional manner. It is a good idea to drill and tap the hole for the wing mounting bolt prior to installing the top sheets so you can see what you are doing.

#### FIN AND STABILIZER:

Cut the fin and stabilizer outlines from 1/16" sheet. Build the framework for each directly on the skin. When this has dried, add the top skin to each and sand to an airfoil shape. Leave the trailing edge of the fin and stabilizer flat, rounding only the leading edge of the rudder and elevator.

#### WHEEL PANTS:

The exploded view of the pants on the plans should give you a good idea of how the friction system works. Note that the wheel collar only presses against the brass tube axle, not against the pants themselves. The ease with which the pants are free to rotate depends on how hard the rubber disc is compressed between the sheet metal fitting and the strut washer. Trial and error is the best guide here.

#### COVERING AND FINISHING:

Having tried the majority of the newer products, I still prefer silk and butyrate dope but every modeler has his own druthers so suit yourself, but keep it light. I gave all parts several coats of clear dope to seal the wood, then covered the parts containing compound curves, ie: the check cowl, the fuselage and the wheel pants with wet silk. The wing, stabilizer, fin and control surfaces were all covered with wet silkspan. Apply consecutive coats of clear dope until the covering material is completely filled and begins to take on a definite gloss. This usually takes five or six coats for silk and three or four for silkspan. Now apply two coats of a dope and talc mix and allow several days for thorough drying. You can glue the stab, fin and cheek cowl in position while prime coats are curing. Make small fillets at the junction of these parts with the fuselage using Sig Epoxolite. This is the nicest, most workable fillet material I have found, and I recommend it highly. Dope adhesion to Epoxolite is excellent. After sufficient drying time has lapsed, sand all surfaces lightly with 400 or 600 paper, used wet or dry. Parts should be glassy smooth when you are done. If not, repeat the dope-and-talc treatment. Remember your finished paint job will be no smoother than the primed surface. Do NOT depend on finish coats to fill any blemishes; they will not. When you are satisfied that all surfaces are as smooth as you can make them, spray on finish coats in your favorite color. Install the canopy and a pilot if you desire, although nothing in the rules says you must. (Personally, I feel bad enough messing with "toy airplanes" without being accused of playing with dolls!). Rub your finish to a high gloss with fine white rubbing compound. Add your racing stripes and numbers. I cut my numbers from MonoKote and find they stay on very well. Install your radio gear and you are ready to race.

#### FLYING:

If you have flown any modern multi-ship, you will have no trouble flying Pokey. Observe control throws shown on the plans for first flights and be sure she balances at the recommended C.G. Make your landing traffic pattern lower than normal and use a long final approach. Speed just doesn't kill off rapidly when power is reduced, so chances are you will be long on your first try. I was surprised at how easy it was to adapt to the two wheel landing gear. Takeoffs and landings are just as easy as with the trike gear setup, and Pokey exhibits absolutely no ground looping tendencies.

'Nuff said — See YOU at the races.