

Squawk Talk

by Kas Thomas

THE AEROBATIC FOLKS know a lot about engine mods. There's a good reason for that. When you're flying knife-edge close to the ground, you don't want little irritations like oil-pickup-tube unporting to distract you. The competition-aerobatics market is small, and fanatical; and the people who build engines for that market are—of necessity—knowledgeable.

Of course, the knife-edge crowd has an ace card that most of us don't have: The planes tend to be Experimental-category. And that means a fair amount of legal leeway for under-the-cowl experimentation—with things like crossover exhaust, tall pistons, unusual cooling schemes, etc. Things that Sky Dynamics, of Moneta, Virginia, specializes in.

Like many aerobatic-engine modifiers, Sky Dynamics owner Kevin Murray (formerly of Enfield, Connecticut) brings much of what he knows about engines from competition-automotive experience. (Sky Dynamics used to be called Frame-Up Engineering—which was originally started to build the tubular chassis for race cars.) Five years or so ago, Murray earned something of a reputation in aerobatic circles for a little item he developed called the Maxi-Sump system. It's now a must-have \$1,800 item, if you're serious about knife-edge flight with your IO-360 Lycoming.

The Maxi-Sump is "in effect, a whole new bottom end for the engine," Murray says. But by that, he doesn't mean a new crankshaft or crankcase; he's talking about the oil sump, oil pickup, and intake manifold. The Maxi-Sump has three distinguishing features: [1] A smaller oil-pan bottom. [2] A swinging oil-pickup tube. [3] Cooling fins in the sump itself.

The smaller pan-bottom raises the IO-360's oil level about 1.25 inches per quart, instead of the 0.25-inch/qt. of the standard sump, so that it's possible to operate on very little oil. (This

is helpful during periods of G-reversal. It means drainback oil will submerge the oil pickup much quicker after, say, a four-point hesitation roll.)

The swinging oil pickup tube is obviously also aimed at keeping positive flow going to the pump. It's a real boon for extended knife-edge flight, hesitation rolls, etc.

Cooling fins on the sump—now there's one of those ideas that's so obvious, you wonder why it's not being done on *every* engine. Kevin Murray does it to the IO-360, of course, so that the oil stays nice and cool. Just having fins doesn't make the sump cool the oil, however: Heat exchange is a double-edged sword, and if you put fins on something that's located in a hot breeze, it'll get hotter, not cooler. A poorly located intercooler becomes an interheater, and a finned oil pan becomes a liability if you don't protect it from hot "cooling" air. Murray, recognizing this, puts an aluminum duct around the sump to block hot air from the cooling fins and route cool air in.

Murray also has a special induction-system mod to bypass intake air around the oil sump. The standard Lycoming intake system, of course, passes all air through the hot sump before the risers emerge to meet the cylinders. This is a great system for atomizing the fuel in a carbureted engine, but in an IO-360 all it does is rob power, like fulltime carb heat—clearly a no-no in the aerobatic world. A Sky Dynamics engine sees nothing but cold intake air.

Murray is semi-famous for yet another mod: the so-called four-into-one exhaust system for the IO-360. It's been Sky Dynamics' dyno experience that one of the most tweak-sensitive areas (for horsepower) on aircraft engines is the exhaust system. "We've found that short tubes with few or no bends in them will tend to overscavenge the exhaust system," Murray explains, "and the result is, a lot of raw fuel is swept right out the exhaust on the valve overlap period."

Murray notes that for precisely this reason, such supposedly beneficial mods as oversize pipes and cylinder porting must be approached with caution. Porting and flowing without regard for exhaust-system back pressure and cam profile (valve overlap, more particularly) can lead to unexpected results, as raw fuel is unwittingly scavenged along with exhaust gases.

What kind of results does Sky Dynamics see in dyno tests of various mods? According to Murray, your stock IO-360-A1A, timed to 25 degrees BTC, produces 377 ft-lbs of torque at 2,700 rpm, or 193.8 horsepower, using straight 30-inch exhaust stacks. Throw the Maxi-Sump system and four-into-one exhaust on the same engine, and you get 408 ft-lbs and 209.7 hp.

Of course, your true inverted-flight aficionado is not going to be happy with mere 8.7:1 pistons, but will want the 10:1 helicopter pistons (LW-11487 or equivalent, for the HIO-360-D1A) instead. Once you install these babies, you'll definitely want to back off a bit on the ignition timing (even with 100LL in the tank) to discourage detonation and its ugly minions. Even so, at 20 degrees BTC you can expect an otherwise-stock IO-360 (with -D1A pistons) to yield 390 ft-lbs and 200.5 hp on the dyno. Slap the Sky Dynamics Maxi-Sump and 4-into-one exhaust on that same engine, and you're apt to see 419 ft-lbs and 215.4 hp.

Most of these mods aren't street-legal for Normal-category planes. (You can talk to Firewall Forward in Ft. Collins, CO about 10:1 pistons for your Mooney, however. Call 1-800-444-0556.) But if your Christen Eagle is coming up on TBO, you should definitely get acquainted with Kevin Murray's bunch, at Sky Dynamics Corp., Rt. 1, Box 170, Moneta, VA 24121 (703/297-6754). Or just drop in to Smith Mountain Lake Airport, 18 DME east of Roanoke. Toggle the smoke system on downwind to let them know you're serious.