

Contrails

Fall 2019

Volume 31, Issue 4



Ron Schwarzkopf provided this photo of Buck Garza's BVM pnp F18 during a low pass at the Greater Southwest Jet Rally in Waco, TX. The markings are the airplane Buck flew prior to retiring from the Marines.

President's Report

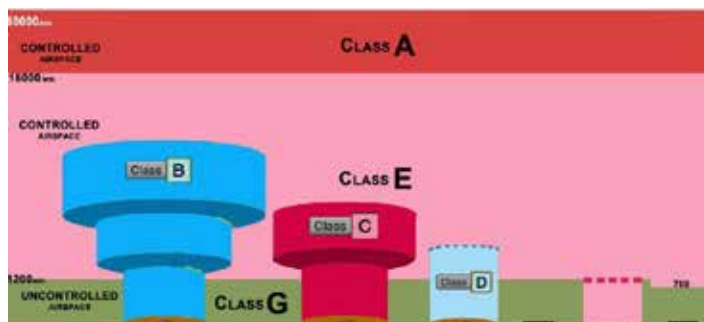
Bob Klenke



The recent correspondence from the AMA talking about altitude limits has included a number of different levels, 400', 700', 1200'. The question might be, where do these numbers come from? Time for a lesson in "airspace 101." Many of you are already familiar with this, but many are not, so let's briefly go over it...

Airspace in the US, and most other countries, is divided up into 6 different classes, Class A, B, C, D, E, and Class G (Class F is not used in the US). There are two main types of airspace: Controlled and Uncontrolled. Class A, B, C, D, and E are Controlled airspace, and Class G is Uncontrolled airspace. Controlled and Uncontrolled airspace refers to manned aviation and the rules with which they must operate when under Instrument Flight Rules (IFR) and Visual Flight Rules (VFR).

The Classes of Airspace are shown graphically below.



Class A airspace is that airspace between 18,000' MSL (Mean Sea Level) to 60,000' MSL. Obviously, as modelers, we do not have to concern ourselves with Class A airspace.

Class B airspace surrounds the nation's busiest airports in terms of the number and types of airport operations and passenger traffic. This includes airports like Dulles, Orlando, Dallas, San Francisco, etc. Class B airspace typically extends to upwards of 10,000' MSL and is comprised of three or more layers – which resemble an "upside-down wedding cake." Notice from Figure 1, only the inner area of Class B airspace extends to the ground and the airspace under the outer areas is usually Class G. The inner area of Class B airspace, which goes all the way down to the surface, is typically a 5-mile ring around the airport.

Class B airspace is shown on an aviation Sectional Chart and a series of thick blue lines, as shown in the next chart. The altitude limits of the Class B airspace are shown in the blue numbers inside the rings, the ceiling altitude in MSL, over the floor altitude in MSL. Notice in Figure 2, the inner ring is "100" over "SFC". The "100" number is 10,000' MSL (the last two 0's in the number are left off). The "SFC" means surface, which tells us that the Class B airspace inside that ring goes all the way down to the ground. The next outer ring, however, has the numbers "100" over "18." Again, "100"

means 10,000' MSL for the ceiling, but the "18" means that the floor of the class B in that area is 1800' MSL. Further out, the third ring has "100" over "50" meaning that in that area, the floor of the Class B airspace is at 5000' MSL.



The good news for us as modelers is that underneath the floor of the Class B airspace is some uncontrolled class G airspace that we can fly in.

Class C airspace surrounds airports that are somewhat smaller, but still have a number of different types of airport operations and passenger traffic. Class C airspace is shown on an aviation Sectional Chart and a series of thick magenta lines, as shown in figure 3, below. Like Class B airspace, the altitude limits of the Class C airspace are shown in magenta numbers inside the rings, the ceiling altitude in MSL, over the floor altitude in MSL. In Figure 3 below, the inner ring is "44" over "SFC" meaning 4400' ceiling and floor at the surface, and the outer ring is "44" over "17" meaning ceiling and floor of 4400' and 1700' respectively. Again, the inner ring to the surface typically extends out 5 miles from the airport, and under the outer ring of Class C airspace is usually some Class G that we can fly in.



President's Report (cont'd)

Bob Klenke

Class D airspace surrounds airports that are less busy than the previous ones discussed, but which still have an operational control tower. Class D airspace is always down to the surface and typically extends out 3 miles from the airport. Class D airspace is shown on sectional charts as a dashed blue line as shown in Figure 4, below. The ceiling of the Class D airspace is shown in the dashed box inside the ring, in this case, 3100' MSL.



Class E airspace is a bit more complicated to figure out. As shown in the first chart, Class E airspace begins at 1200' AGL (above ground level) over the entire area of the US that is not inside Class B, C, or D airspace. In addition, there are areas where Class E airspace is lowered to 700' AGL, and in other areas Class E airspace extends all the way down to the surface. Class E airspace is generally associated with uncontrolled airports, i.e., airports that do not have a control tower, but do have some type of instrument approach, and a significant amount of IFR traffic.

The two types of Class E airspace are shown in Figure 5. The perimeter of the Class E airspace that extends down to 700' AGL is denoted by the shaded magenta lines. The Class E airspace that extends down to the surface is shown by the dashed magenta lines. The Class E airspace that extends down to 700' is called a "transition area" and is intended to protect the airspace where aircraft are operating on IFR approaching an airport. The Class E airspace that extends down to the ground is intended to protect aircraft that are actually in an instrument approach to land at the airport.

Note that the Class E "transition area" airspace that extends down to 700' also typically encloses CLASS B, Class C, and Class D airspaces around controlled airports. These Class E transition areas can also be seen in Figures 2, 3, and 4 as well as Figure 5.

(See top of next column)



So now that we know something about airspace, what can we do with that knowledge? Well first, being able to read the aeronautical charts and determine the type(s) of airspace in a given area is a major part of the knowledge test for commercial operation under Part 107, so it's sure to be part of the "knowledge test" being developed for recreational operation.

Using that knowledge, we can also take a look at the airspace over our own AMA fields and see what type of airspace we're flying in at the field. Sectional aeronautical charts are available online at skyvector.com. As you can see from the figures, most features on the ground, like roads, that you might use to figure out exactly where your flying field is located, are not shown. However, you can use another application like Google Earth, to find the latitude and longitude of your field, and then use those to find your field in skyvector.com.

Once you've located your AMA flying field in a Sectional chart, you can determine what type of airspace it is under. For example, our flying field, the Richmond Area Radio Control Club, is located at 37° 20.2' N and 77° 14.18' W. Figure 6 shows the location of the RARC field on a Sectional chart, denoted by the red star. From this we can see that the field is outside the outer shelf of the Class C airspace that surrounds Richmond International Airport, but it is underneath a Class E transition area associated with the airport that extends down to 700'.



President's Report (cont'd)

Bob Klenke

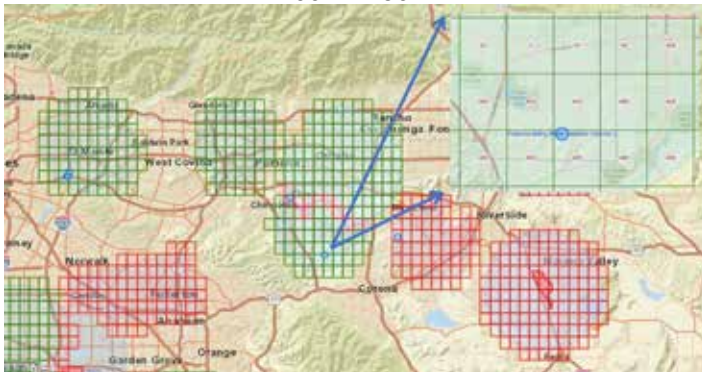
Recently, the AMA has indicated that the FAA Air Transportation Office (ATO) has indicated that AMA fields in Class G airspace will have a ceiling of 700' or 1200' depending on their location. Sound familiar based on our airspace discussion?

Now I must make a disclaimer saying that I have NO inside information from the FAA OR the AMA, but my feeling is that this because ATO does not want any UAS operations (including model aircraft) in Class E controlled airspace that is over Class G airspace. I have been involved in UAS operations professionally for over 12 years under FAA Certificates of Authorization (CoA). These CoAs are approved by the FAA and the last step in the process is approval by the local Air Traffic Office having jurisdiction over the airspace in question. In that time, I have never seen ATO approve UAS operations at altitude over the base of the Class E airspace (i.e., all operations needed to remain in Class G airspace).

As far as operations in controlled airspace that extends to the surface around airports (Class B, C, D, and Class E to the surface), ATO has already issued their opinion as to the altitude limits in that airspace in the form of the UAS facility maps. The UAS facility maps show the maximum altitudes that UAS (either commercial or recreational) can get approval for operation. You can find the UAS facility maps at:

<https://faa.maps.arcgis.com/apps/webappviewer/index.html?id=9c2e4406710048e19806ebf6a06754ad> or do a Google search on "FAA UAS facility maps"

The FAA is starting to put approved R/C airfield sites on the UAS facility maps. An example is shown in Figure 7, below. In this case, the field is in a segment where the altitude ceiling is 400', so the club shown has approval to fly up to that altitude. Notice that other segments have lower altitude limits, some all the way down to 0 feet. Clubs that have fields in airspace like this are thus far being given permission to only fly up to the ceiling shown on the facility map, in some cases that is as low as 100' or 150'.



The AMA has said that this is contrary to what the FAA has told them will be the policy going forward, and we all know that this is contrary to what we have been able to safely do in the past. However, it is consistent with what the FAA ATO has been doing for a number of years.

So will this be the policy going forward, or will we be able to retain more freedom to operate at higher altitudes? Perhaps after further study, ATO will grant permission for higher altitudes for clubs in locations that do not have a significant number of full-scale operations, in spite of the height of the Class E airspace they are under. Perhaps the local ATO offices will have the ability to approve something akin to "airshow waivers" for jet events of limited duration in certain locations.

As I said, I don't know, or have any more information about that than you all do, but I'm holding out hope that working with the FAA in a measured, professional approach to balance safety for manned aviation while maintaining our historical access to the airspace will produce results.

On a more enjoyable note, I was able to attend the annual Tiger Meet in Lake City, SC this past October. It's a great facility with a long, smooth grass runway with lots of open flying area. Jamie Snipes and the other club organizers do an excellent job of hosting the event. If you're able to attend



next year, I highly recommend it. Here's some pictures of the flight line.

Oh, just a reminder that soon it will be time to renew your JPO membership for 2020. You can renew online using Paypal here: <https://www.jetpilots.org/renewal> - Please renew - we can use your support!

If you're not sure of your membership status, you can contact the JPO Treasurer, Marty Gurewitz, and he can check on it for you. His contact information is in this issue.

Until next time!

Bob



Vice President's Report

Jim McEwen

Welcome to fall! I had a great summer flying both jets and warbirds, and I attended events in six states and two countries. In the vast majority of cases, the events were well organized, and safely conducted including the flying. Building and flying radio-control airplanes is a fantastic hobby, and one that I've enjoyed for about 40 years and will continue to enjoy. I'm a lifer, as they say, and I feel strongly when I see something that's unsafe. We've all seen planes crash, and it's usually far away, but sometimes the impact point is a bit close and we can see what energy can do.

About 30 years ago at my local club, a guy was flying his .40-sized trainer while standing at the edge of the grass runway. Just as he was landing, he lost control and the leading edge of the wing struck him in the lower leg. This resulted in multiple compound fractures of his leg and he required a couple of surgeries. It was a long and painful road to recovery. It was horrible for all involved, particularly the pilot, and nobody thought that such a plane, flying that slowly, could do that kind of damage ... apparently it can.

That was an approximately five-pound trainer landing at about 20 mph. Consider the energy involved when flying one of our jets. A well-known sport jet, for instance, weighs about 25.5 lbs (11.6Kg) empty. It's capable of a wide-speed range of well over 200 mph when a 140 or 160 is installed, and the slowest it ever gets is when it lands at about 40 mph (17.9 m/s). At this point, the calculation of its kinetic energy is as follows:

Kinetic energy = $\frac{1}{2}$ mass x velocity²
Which translates to: $(0.5)(11.6)(17.9)^2 = 1858 \text{ Joules}$

Kinetic energy is proportional to velocity squared, so an increase in speed has a tremendous effect or energy. In the middle of the flight with 3.5 lbs of fuel on board (a total weight of 29 lbs or 13.2 Kg) and flying around at a comfortable 170 mph (76 m/s), which is half throttle on this jet when powered by a 140, the plane's kinetic energy becomes: $(0.5)(13.2)(76)^2 = 38,121 \text{ J}$

At full throttle in level flight, or by diving, the plane can reach 250 mph (111.76 m/s), which gives a kinetic energy of: $(0.5)(13.2)(111.76)^2 = 82,435 \text{ J}$ which is more than double the energy at 170 mph.

Now, these numbers likely won't mean a lot to many people so let's invoke some comparisons. A baseball thrown at 105 mph has a kinetic energy of 164 J. If you got hit in the head by it, you'd probably be injured though the baseball has less than 1/10 the energy of the plane landing. A 125 grain .357 Magnum round has 790 J of energy at the muzzle. A five pound brick dropped off a tall building will reach a terminal velocity of about 95 mph and has 2081 J of energy.

So, this common sport jet, when at its lightest and slowest (just before landing on vapors) has almost 2.5 times the energy of a .357 Magnum and slightly less than a brick dropped off a tall building. You sure don't want to be hit by any of these. If the plane was flying at 170 mph and crashed into a person, it would impart the same energy as shooting them 48 times simultaneously with a .357 Magnum or dropping 2 dozen bricks on them off a building. If the plane was flying at 250 mph and hit a person, it would be like being shot simultaneously 104 times. The person is not getting up.

Of course, that doesn't include the energy released from any fuel fire/explosion.

A failure of a control system, structure, or pilot error can bring all that energy into the pits or spectator area before anyone can react. That's why we lessen the risk by keeping high-energy maneuvers away (e.g. high-speed passes on the far side of the runway) and don't allow flying towards the pits or spectators. So, if you see somebody flying towards the pits or spectators, or if you see someone flying too fast, don't just ignore it; speak up! It's up to us to keep our hobby safe. Just one incident could be very bad for this hobby, not to mention the potentially disastrous consequences on those directly involved, particularly anyone injured.

Onto happier matters...

I recently attended the Fall Jet Classic at the Rosewood R/C Club in southern Indiana. I had attended a couple of years ago and had a wonderful time, and this year was just more of a good thing. First of all, the facility is fantastic, with an approximately 800-foot long paved runway, plenty of covered concrete pits, paved parking, camping spots, power, running water, the works! For those people not camping, there are several hotels in the area including a hotel/casino only 10 miles away that features some good restaurants and gaming tables. I booked online and got a great deal.

There were 50 registered pilots with several folks arriving early in the week, or even during the previous weekend, so there was plenty of flying. Bob Belluomini (CD) and Ken Stewart did a great job in organization, setup, and making sure that everybody was welcomed and taken care of. The flying site is wide open with no obstacles (the power plant to the left is about 2.5 miles away (though it may look closer in pictures). I had a great time flying, as well as spotting, wrenching, and socializing with the great folks in attendance. The dusk flights (low, slow, with plenty of smoke) were quite the thrill to watch before getting the grills going for plenty of good eating. We were regaled by the swinging sound of the Nashville Jet Band (you have got to hear their original song "Kerosene") followed by camaraderie around a campfire as it gets a bit chilly at night.

Several planes really caught my eye so I snapped some photos as seen below.



Mark Feist and his twin edf, Airworld Me262. 80" span with impressive performance and scale-like flying made it a pleasure to watch.

Vice President's Report (cont'd)

Jim McEwen



Compliments to Glen Sheppard who, besides being a cook-extraordinaire, designed and scratch-built this F9F Panther. Well done!



Ben Burden with the awesome Cheetos *Bandit*. Ben's tanks feature lights on the front and back that look great during dusk flights.



This swing wing, 4 EDF powered B-1 certainly an attention getter, however I didn't get the name of the owner.



Doug Boyle with his brand new Skymaster F-4 powered by twin K-180s. It's a beast!!!



Jim with his Yellow Aircraft CF-18 in Canadian colors. K-210 for power and Jeti for guidance.

Well, that is it for now. If you are in the north, it's time for the end of season maintenance and putting the jets away for the winter. If you are in the south (or Phoenix), flying season with comfortable temperatures is well underway. Enjoy! I have a couple of business trips to the south and out west this winter, so I hope to stop by.

Until next time,

Jim



The Nashville Jet Band (Glen Sheppard, Hank Miklich, Randy Moore, Scott Harris) were gracious hosts and most entertaining!

District V Report

Chris Lavin



Alabama
Florida
Georgia
Mississippi
Puerto Rico
South Carolina
Tennessee
US Virgin Islands

Hello from District VI! What a great season of flying we have been having here in Florida. As many who know me are aware, I am an AVID jet guy. I lean towards sport jets, because honestly, while I am a decent builder, I do NOT have that artistic ability or experience to create an impressive scale project. Which is why I love to attend events like Super Jets South where craftsman of all types, show their projects and they are beautiful. That's not to say that there are not some beautiful sport jets there too ... because there are!

I was fortunate enough to attend the 2019 Super Jets South event at Georgia Jets, and I have to tell you I LOVE this event. The guys there are great! Mike Pascoe (CD) puts on a GREAT event with the help and support of the WHOLE club. I can tell you these guys know how to put on event. I have felt welcome from the first time I attended. They work their BUTTS off to make sure everything is perfect!

Here are some pictures courtesy of Rommel Shumpert aka: Desert Fox.

Until next time!

Chris



District V Report (cont'd)

Chris Lavin



Treasurer's Report

Marty Gurewitz

Beginning Checking Account Balance 8/1/2019:		\$4,414.11
Income		
Members dues and Total Income:	\$145.51	
Expenses		
Contrails Printing	\$458.74	
Rex Bryant JPO event banner reimbursement:	\$245.00	
Total Expenses	\$703.74	
Ending Checking Account Balance		\$3,855.88
Current Pay Pal Account Balance	\$0.00	
Total Cash On Hand 10/31/2019		\$3,855.88

District VII Report

Tim Toutant



Kentucky
Illinois
Indiana
Missouri

Well, here it is late October and the wind, rain and cold weather have struck. Hopefully, there will be a few more nice days to get out and fly before the snow flies and the really frigid temperatures return. This will bring in the building season for next year's new project, and for the repairs that are needed on that trusty jet that has been flying all summer.

This summer has been great for jet-flying and I have been to a couple of jet fly-ins. One was the EDF Jet Jam in Rosewood, IN with 103 pilots in attendance. Many great aircraft were on hand with several new edfs taking center stage, such as FMS's upgraded, winter-camo-painted A-10 flown by Ali Machinchy. It's a really nice flying aircraft in his capable hands. I also had the opportunity to fly my Freewing A-10 for an evening sortie. With all the lights on it looked fabulous against the evening sky.

Then it was onto the E-Jets and E-Warbirds at Deer Creek State Park in Ohio where Terry Nitsch was in charge of this great event. There were six FreeWing A-10s on hand to fly formation, including my A-10. We had a blast with everyone making perfect landings.

The third jet rally I attended was at the Monroe-Custer Airport in Monroe, MI. Chris Tucker flew his T-33 with two other T-33s trying to get that tight formation going. There were nice sport jets on the ramp, also. At first it looked like it was going to be a rainy day but the rain held off with the breeze right down the runway.

Then it was on to Chatham-Kent in Ontario, Canada for Thunder Thrust. They are a great bunch of guys. It was a hot humid day and I wasn't feeling well but did get some pics. My friends Chris Tucker (T-33), Jordan and Larry Peterson (F-86), and Peter Douppnik (*Diamond*) were there to show off their flying skills. A lot of beautiful scale and sport jets were flown all day long.

Hopefully, next year I'll be able to get to a few more jet rallies and participate. My Skymaster Extreme F-4 now has a drogue chute to install, thanks to Paul Helmsman. It is 21" in diameter and looks great. I can't wait to see it deploy on its first landing!

I'm looking forward to seeing other meanderings from around the district and please send any information that you may have of upcoming events for next year. I am also proud of flying the JPO Flag at each of these events. Till then,

Fly Safe!

Tim



Six Freewing A-10s all flew together at the E-Jets and E-Warbirds event at Deer Creek State Park, OH.



Chris Tucker's T-33 at Monroe, MI.



A large F-15 at Monroe, MI.



Tim's A-10 and an e-Flight F4 at Monroe, MI.



Peter Doupnik with his Aviation Design *Diamond*.



The drogue chute for the F-4 by Paul Helmsman.



A large A10 at Thunder Thrust.





District VIII Report

Ron Schwarzkopf

Arkansas
Louisiana
New Mexico
Oklahoma
Texas

Howdy from District VIII. Well, the earlier hot summer months may have been slowed us a bit from a jet flying perspective, but this last month-and-a-half has been very busy for this district. So busy, it's hard to get any building in! So here's a wrap-up of what's been going on.

Upcoming events in District VIII – none in next 3 months. Take a break - Go Build!

37th Greater Southwest Jet Rally, Sept 5-8

The Heart Of Texas Model Aircraft Club once again hosted this event at their field in Waco, TX. As was last year, it was CD'd by Larry Garrett and Dawn Ellzey, and drew in 65 pilots from 9 states. The first couple of days were quite hot, but still tolerable for most, and the rain stayed away. We all got to see the first flight of the *Rogue* – the newest sport jet from Elite Aerosports, and it flew quite well. Local flyer Ronnie Dean flew his Great Planes Pitts M12 biplane - which is prop-powered with a DLE-55 engine, but with a Jetcat P-70 mounted between the landing gear. Three Skymaster F-4s showed up, but we missed an opportunity for an F-4 line-up photo...We finally got to see Pete Lawton's Trump Airliner fly, along with a pair of BVM p-n-p large F-18s. All in all, another successful jet fly for the HOTMAC club, and we'll be back next year!



Ronnie Dean's Pitts (above) and his large F16, which was constantly in the air.



The line up of *Reactions* in Waco. Ron's in the back, David Hudson's in the middle and Bryan McLarty's in front.



Paul Bloxham's Hawker *Hunter* pops the drogue shoot.



The Lubbock gang assists Nick Morrow in setting up his F104.



Ron's Mig-21 shares the ramp with a Mig-15 at the Greater Southwest.



Greg Moore's *BobCat-XL* taxis out for another flight.



Pete Lawton's Trump 727 Airliner.

5th Annual Louisiana Jet Rally, Oct 18-19

The SHARKS Club hosted their jet fly at Minden Airport, which is about 30 minutes East of Shreveport, LA. John Judice and Terry Monroe CD'd the event, and it was the first time this event was run at this airport. Terry, in case you might not know, has been the supplier of the JPO Top Gun trophies, for longer than I can remember. The club brought in about 35 pilots, which is pretty good considering the new location. Airport management seemed very accommodative to the event, and was in continuous contact with nearby full-scale traffic; model pilots would simply land to allow for any full-scale needs. Hopefully, these types of operations will continue to be allowed by federal agencies for years to come. And, we all hope to return next year!



Elite Aerosports new *Rogue* made its debut in Waco, TX.



Buck Garza performs a high-alpha pass with his SM, large F-4.



Bob Price does a low pass with his Epic *Victory*.



Andy Andrews BVM pnp F-18 reaches for the runway.



Louisiana F-86s waiting to go fly.



T-33 Foam Turbine from Jetwerx.

District VIII Report (cont'd)

Ron Schwarzkopf



James Hillin's J-10

Bomber Field Jetoberfest, Oct 25-26

I will cover this event in the next issue, to condense this column.

My Current Build Project – Sukhoi Su-17 *Fitter*

I am working on a 1/6 scale Su-17 *Fitter*, and in my last column I highlighted some of the effort regarding the landing gear. This brings us to late Spring of 2019. Since we had warmer weather coming, it made sense to start on fabrication of fiberglass parts. The elevated temperatures would allow for the epoxy resin to flow and cure better, lessening the need for application of heat. Starting on the horizontal tails first, since they're not huge parts, would allow me to get started climbing up the learning curve again for the process, and if I have a failure early on, the work can be redone quickly.

I had purchased a small vacuum pump from Harbor Freight six months earlier, and was intent on using it to vacuum bag my parts and after experimenting with tank size, gauges, and check valves, I finally had a system that would work reasonably well. I found that for my setup, putting the entire mold with the layup into an oversized bag would hold vacuum much better than trying to seal a bag directly onto the perimeter of the mold, although I tried both methods. I was able to get vacuum pressures of 22-24 inches Hg (11 to 11.5 psi) pretty consistently.

I also decided to stick with my past method of building a fiberglass skin with carbon fiber reinforcements and bulkheads, instead of using the Airex (Herex, or other types) foam sandwich method used on most ARF models. There are surely pros and cons for each method, but this was my decision, at least for the first prototypes. There would also be structural bulkheads and ribs within the final part assemblies to transfer additional strength.

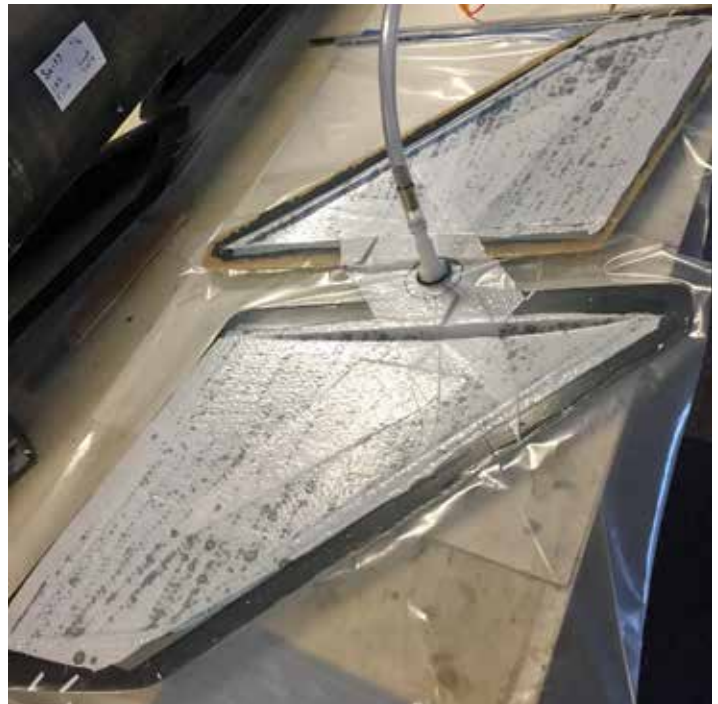
At the end of summer 2019, I had enough parts for two aft-fuselages, with minor variations between the two. I also had made several control surfaces using the same method. Next will be to start on the forward fuselage and remaining wing parts. If winter temperatures in my shop become an issue, I have many more assemblies I can work on.

That's it for now. Next is to prep for the upcoming Arizona Jet Rally, and next column I'll cover the Houston Jetoberfest Jet Fly... Until then, go build or fly a model jet!

Ron



Horizontal Tail Bagging



Horizontal Tail Bagging - Improved.



Aft Buildup.



District X Report

David Reynolds

Arizona
California
Guam
Hawaii
Nevada
Utah

I would like to open with an apology for missing the last issue; all I can say is that I have been suffering from a general lack of hobby time lately. But that is changing!

One change is a new arrival in my shop. As some of you have figured out by now, I have a fascination with the unconventional in general and airplanes that require no runway in specific. So it should be no surprise that when I saw the Flex Innovations FV-31 *Cypher*, I called up Paul Steinberg at House of Balsa and put my name on the list to get one.

What made it to my door was a Russian nesting doll set of very carefully packed boxes. Each individual part is in its own box. I have never seen such complete protection of parts ever. Your favorite shipping company will have to work hard to damage this bird before it gets to your house!

Assembly consists of gluing the verticals to the rear access hatch, sliding the carbon fiber spars into place before attaching the wings, and bolting on the landing gear. It took me about fifteen minutes. One surprise for me was that the landing gear already had flats in place for the wheel collar set screws. Granted, it's a little thing, but it shows the attention to detail. The next piece of the puzzle is programming. For my old DX9 the basic setup was as a fixed-wing craft and then setting the throw directions and limits per the directions.

That just leaves the onboard flight system setup. For this you have one of two options, both included in the box. You can either plug the flight board directly into your computer, or you can use the included Bluetooth attachment to link up with your phone or other capable device. Both options require installing the Speedy Bee app. I used the Bluetooth option and found the Speedy Bee app to be one of the easiest programming interfaces I have worked with. A large part of that setup is tilt endpoints for the rear fans. For this Flex Innovations provides laser cut gauges to take out the guesswork. A gauge for setting the neutral point on the elevons is included as well.

All that is needed from there is a charged 3s 45C-rated battery and the *Cypher* is ready to go. I will pause here for a quick word about batteries: use good ones! Four edfs running all at once pull a lot of power. Flex states that it will fly on a 2200mAh battery. I was impatient and used one of my more experienced 2200 3s packs for initial testing and while it did fly, the battery was not too happy about it. I have since picked up a 5200 60c pack and it works much better.

My first attempts at flight were in the backyard and my first impression was, wow, this thing moves a lot of air! Just getting off the ground filled my yard with a cloud of dust which no other VTO in my fleet has made before. I also had a considerable amount of drifting going on. A bit of research led to the conclusion that in my impatience to get in the air, I skipped the step where centering is confirmed. This step is easy enough to accomplish using the Speedy Bee app in concert with centering adjustments in the transmitter programming. Once my error was corrected, the *Cypher* hovered hands off with no problems.

So how does it fly? In a word, great. Hover control is what one would expect from a quad that is tuned for easy flight. Moving into the "magic" mode with the rear fans set

to a 45-degree angle, the *Cypher* becomes quite agile and sporty. In full-forward flight it moves out with a good amount of speed. So far my only complaint is that I have not had the time to even touch exploring the flight envelope yet. What has impressed me the most so far is the ease of transition between flight modes. The *Cypher* is the fourth commercial VTOL I have added to my collection and this is the first one that moves between flight modes with zero drama. Unlike some that I have, control is retained throughout the transition. Unlike others, there are no strange control oscillations nor is it a crap shoot on where you will end up. It is truly a seamless transition between hovering and forward flight.

I look forward to further exploring this little EDF and finding out more of what it can do. Future modifications may include retracts, it is a jet after all!

That is all for this go around, keep the low passes where they belong.

Dave



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Rommel Shumpert captured this engine start at the Super Jets South event.