

THE SLOW ROLL



President—Lou Pfeifer IV
Vice President—Andrew Schear
Treasurer—Nate D'Anna
Secretary—Carlen Cyphers
Editor—Bob Purdy

SEPTEMBER 2017

The Slow Roll is published by the Sun Valley Fliers by and for its membership to all others interested in the building and flying of radio control aircraft.



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SEPTEMBER 6 SVF MEETING



Presidents Report For September 2017

Hello everyone,

Another month has pasted by already. I wish I could say things are cooling down but they are not! We are still experiencing limited attendance at the field which is to be expected.

I hope all of you have had the chance to see our NEW SINAGE on the flight stations. Bob True and I installed them a few weeks ago. I hope you all approve. We are waiting for the cooler temperatures so we can get started on recovering the tables and doing other much needed repairs.

Wayne Robinson and I are in negotiations with the City Of Phoenix to renew our Use Agreement for SVF which expires on December 17th of this year. Thanks to Wayne for all his work in this matter to assist me in getting this done! He is a great addition to the Board of SVF! The next thing on our agenda after final approval of our Use Agreement will be to secure bids for the runway project.

Our Annual Membership/Family Fly-In is rapidly approaching. We are going to schedule it for November and we will put a firm date to it at the Board Meeting this Month. We are choosing the best date so EVERYONE can attend!! Hopefully we can beat last year's attendance of 130!

We will be having 2 members from **Flex Innovations at our September Meeting** to talk about the Aura 8 Gyro System along with some of their other projects. They will have on hand some of their planes and parts and gyros for purchase at the meeting. **Thanks to Bryce Hatfield and Joe Birch!!**

Well that's about it for now. Please try to come to the Meeting on Wednesday September 6th at 7:00 PM at Deer Valley Restaurant. If you are planning to eat please get there by no later than 6:30 as to not disturb the meeting. Hope to see you all there!

Thanks

Lou Pfeifer IV

President SVF





Membership Meeting Agenda – August 2, 2017

Meeting called to order by Lou Pfeifer at 7:01 PM. There were 19 members present.

Officers: President - Lou Pfeifer, VP - Andrew Schear, Secretary - Carlen Cyphers, Treasurer - Nate D'Anna

Board Members: Wayne Lane, Steve Myers, Wayne Robinson, Bob True, Jamie Edwards

Absent: Ernie Mack, Bryant Mack, Tom Kametz, Scott Johnson

Open:

- 1) Incident out at the field two weeks ago. A gentleman lost control of his airplane and crashed out in the desert on a hot day, 6:30AM, no water, no hat. Got stuck out in the desert. Notify someone that you are going to retrieve your airplane and wear proper attire.
- 2) A club member tied down his airplane to start it since nobody else was there. He had no spotter either. These are both dangerous activities – make sure you have someone to hold your airplane when starting it and make sure you have a spotter.
- 3) Couple of complaints about IMAC guys made by several club members. If you have a caller then you must have a second spotter to keep watch.

Guests: Daniel and Richard

New Members: Spencer Key

Solo Pilots: Spencer Key – Instructor is Steve Miller .Thanks Steve!

Secretary's Report: Carlen Cyphers No report for July since we had no meeting

Treasurer's Report: Nate D'Anna - Toni Quist motion, Ron Thomas second

- 1) Treasurer's report was approved as written. Report on file to see by request.
- 2) Latest AMA magazine mentioned John Geyer in regards to his 1/8 scale aircraft and Bernie Frank photo with Don Roberts in the District X report

Membership Director's Report: Bob True/Scott Johnson 239 members as of 08/02/2017

Safety Officer's Report: Ernie Mack Ernie Mack absent - no report

Old Business:

- 1) **New sign at entrance gate. New flight station signs!**
- 2) Painting fences orange once the weather cools down
- 3) SVF charger donated was a NiCd charger and not a LiPo charger – it has been removed

New Business:

- 1) **1/8 Air force event at the end of October (Saturday and Sunday) – not an SVF event (FLYER IN SR)**
- 2) **Annual SVF membership fly-in in November most likely**
- 3) Lease for paving agreement with city will be discussed and renewed in September. As soon as contract is firmed up we will get bids to redo the runway. Likely will cost 50k-60k. When we redo it they will re-use the current runway as a base (pulverized) and then place the asphalt on top.
- 4) **American Aviation Historical Society – group gets together and presents various topics about aviation history – over at TransPac – 7:30, 3rd Wednesday of the month, if you are interested contact Lou**
- 5) Look into increasing camping limit from 4 people to 8 people

Door Prize Winners:

- 1) Wayne Robinson
- 2) Spencer Key
- 3) Tony Quist
- 4) Paul Brown
- 5) Bob True
- 6) Nate D'Anna
- 7) Johnny Russell

50/50 Winner:

Steve Miller – wins \$25 donates some of the money back!

Show & Tell: None

Meeting adjourned at 7:40 PM (Rob Thomas motion, Lou Pfeifer Sr. second)

Respectfully submitted,

Carlen Cyphers



Board Meeting Agenda August 7, 2017

Meeting called to order by Lou Pfeifer at 6:29 PM. There were 11 members present.

Officers: President - Lou Pfeifer, VP - Andrew Schear, Secretary - Carlen Cyphers, Treasurer - Nate D'Anna

Board Members: Jamie Edwards, Scott Johnson, Tom Kametz, Bryant Mack, Ernie Mack, Steve Myers, Wayne Robinson, Bob True, Nate D'Anna, Wayne Layne

Absent: None

Open:

- 1) Welcome Jamie to the Board.
- 2) Does everyone who is currently on the board want to remain on the board? Yes
- 3) Short discussion about various emails.

Secretary's Report: Carlen Cyphers Approve July's Minutes (Ernie Mack) – Andrew Schear motion, Nate D'Anna second

Treasures Report: Nate D'Anna Approve July's Financials – Steve Myers motion, Wayne Layne second

Safety Officers Report: Ernie Mack

- 1) Discuss Caller/Spotter – Making sure that IMAC flyers have both a caller and a spotter in order to keep an eye on full scale airplanes. IMAC flyers have been contacted. This applies to everyone, not just IMAC guys.
- 2) A club member crashed his airplane on a hot day. He took his truck out to retrieve the airplane and got lost. To make matters worse his truck got stuck in the desert. No one had seen him in 2 hours so emergency services were contacted. Moral of the story is to make sure you have water if you are going to be retrieving an airplane and make sure your fellow club members know what you will be doing.

Membership Services: Bob True/Scott Johnson 2 new members - 239 members in 2017

Old Business:

- 1) Made transitions for Club Nameplates. Moved to C&C Engraving. Saves about \$3 per nametag. Nate is going to contact them and discuss the billing.
- 2) Approve Color for Nameplates (Vote) – white nameplates; traditional pin will be used over magnet
- 3) **Revisit IMAC proposal from Ernie – March event, East Valley Aviators has three or four events each year but has caused issues with too much field shut down time. We would like to bring one of these events back to SVF or create an entirely new IMAC event. This event would shut down the field Friday through Sunday. There would be 40-50 contestants with a \$50 entry fee for IMAC and \$60 for a non-IMAC member. This would bring in about \$2000 dollars for a 40 person contest, with \$500-\$600 of it being expenses to cover the event. This would be a SVF club event. There would be two spotters on the roof of the ramada with a bull horn. Ernie has a few guys in mind who could be potential a contest director. Ernie would handle getting the event setup. Currently, only four campers are allowed at SVF. We might be able to bump that up to eight campers.**

Motion to approve IMAC SVF event by Nate D'Anna, Andrew Schear second; Approved by board.

- 4) Signed 1/8 Air Force agreement for late October. Field will be closed for 2 days. Cost will be \$30 per day for generator fees. The generator shed will only be opened and closed by Bob, Lou, or Andrew. Lou will contact Flood Control to up the number of campers allowed for the event as per all our events.
- 5) Revisit PA purchase with Nate. Eight or nine months ago SVF had an event and entertained the idea of buying a PA system. This idea was tabled at the last meeting. Nate has done some research on the topic and has figured we could get one just shy of \$1000. Given the number of events we have is it worth it? Nate says no. Renting may be cheaper. Board has tabled it until after the runway has been taken care of.

New Business:

- 1) New signage has been put up at gate and flight stations. All the old clutter has been removed and the chain-link fence and poles will be painted orange. The current blast shields and zip ties will be removed due to deterioration. Brass grommets and stainless steel wire will be used and some of the fencing will be fixed. A few tables will be finished as well.
- 2) Discuss a firm date for Annual Membership/Family Fly-In – tabled until next meeting – Jamie will give us a date for the November helicopter fly in.
- 3) Wayne and Lou to start discussing what is needed to renew our Use Agreement with the City of Phoenix/Maricopa Flood Control. Expires on December 17, 2017. Lou will get together with Wayne and review it. The plan is to submit the existing contract that we have. Once this is nailed down we will discuss the runway. Not going to re-seal the runway (lasted 8 months) – there is no base under the runway anymore. The board had a short discussion about renewing our contract longer than five years.

Meeting adjourned at 7:36 PM (Andrew Schear motion, Nate D'Anna second)

Respectfully submitted, *Carlen Cyphers*

AMA FOUNDATION JET RALLY 2017 AUGUST 24-27, OTTUMWA, IOWA



Photos by Dan Bott

AMA FOUNDATION JET RALLY 2017

AUGUST 24-27, OTTUMWA, IOWA



Photos by Tony Quist

AMA FOUNDATION JET RALLY 2017

AUGUST 24-27, OTTUMWA, IOWA



Lawrence Tougas
Fairfield, California

AMA Excutive Council 2017 Campaign Statements DISTRICT X



The AMA has lost its way.

The AMA has stopped listening to its members.

The AMA was founded by traditional Modelers and needs to remember that.

If you agree then please vote for me Lawrence Tougas to be the next Executive Vice President (EVP) of the AMA.

Last year I ran for President of the AMA on a similar platform. I believed then and I believe now that the majority of members in the AMA have been and always will be traditional modelers; whom I define as pilots of fixed and rotary wing models whether they be free flight, control line, or radio controlled. This is opposed to the newest segment of modeling, drone modeling.

I do not believe we should ban drone modelers from the AMA, far from that, I think as long as they fly responsibly and follow our safety code they are welcome to join. My issue is the irresponsible drone modelers who have caught the media's attention. Their actions must be stopped before more harm is done.

The number of drone modelers in the AMA has plateaued at 8% of total membership. As the current District X VP I have access to our membership numbers and have been observing this trend for some time. One issue I see is that we spend much more than 8% of our staff's time on issues associated with drone modeling. The Executive Council has spent the last several years addressing drone issues well out of proportion to 8% of our time.

I think there should be more or less a balance of our time and resources spent between the various modeling disciplines. The claim that drone modeling will be a great source of future membership is simply not being reflected in our membership data. That fact has to be recognized and the AMA's time and money need to be re-balanced to support our core constituency which is overwhelmingly traditional modelers. Elect me as your EVP and I will make that my goal.

I have served as the AMA's District X Vice President for almost 7 years. During this time I have worked on our Finance, Election and Insurance Committees. During my time on the Executive Council there have been times when I have disagreed with programs that we were developing. When those times come I am not afraid to speak truth to power. You can count on me to keep what is best for our membership as my number one priority.

I have made it a point to travel the district attending events and meetings with as many clubs as possible. I fly competitively. I currently fly Precision Aerobatics in the Advanced class and have attended the last 4 NATS. I have spent 26 years working as an Engineer with a major U.S. airline. During that time I have dealt with the FAA extensively. I have over 23 years of experience in the FAA rulemaking process. I am the only candidate with this much experience with the FAA.

Please follow my campaign at, www.tougas4evp.com.

Like me on Face book at <https://www.facebook.com/tougas4president>

Follow me on Twitter at <https://twitter.com/tougas4pres>

Sincerely,
Lawrence Tougas
AMA 232

P.S. Remember if you want the AMA to be balanced in the way it treats its members then I am the right choice for AMA EVP.

My Aerobatic Training Experience

Carlen Cyphers *SVF Secretary*



Today (April 2nd, 2017) marked my last aerobatic flight in the Great Lakes 2T-1A-2 at Chandler Air Service. It also marked my 80th hour of flight time. I started aerobatic training to transform my feelings of nervousness and uncertainty into confidence – and it worked.

I got my Private Pilot License (PPL) last year in June 2016. Despite passing my check ride with flying colors, I didn't fly for several months after getting my ticket. It was middle of summer and my dad and I were searching for an airplane. In October we picked up a beautiful 1965 Cherokee 140. However, in those past few months I had really lost my confidence in flying. Despite being - what I think anyways - a competent pilot (albeit "green"), I just didn't feel completely comfortable flying. I felt like my Private Pilot training had left a lot to be desired in terms of experiencing the

full flight envelope. They say you only see about 5% of an aircraft's flight envelope during your PPL and about 11% during your CPL. That is a lot of unknown territory that you haven't seen as a pilot.

I had always been uncomfortable with power on stalls and unusual attitudes during my PPL training. I was competent enough to do them and demonstrate them on the check ride, but they were truly nerve racking at the time. I had never seen a spin, but the stories of pilots killing themselves on base to final had really made me nervous. What would I do if I got into an unusual attitude? A spin? A situation I had never seen before? Looking back, I realize being so nervous about stalls and spins was simply a lack of understanding and experience. Falling leaf stalls - I don't know why every instructor doesn't teach this. What an incredible exercise for new pilots.

I had been thinking about aerobatic training for quite some time as I thought it would really open my eyes and give me the boost of confidence I had been searching for. Interestingly enough, I posted on an online pilot forum to get some opinions on aerobatic training – the responses were mixed. "Flying an aerobatic plane won't do anything for you right now", "Dude you should give up flying, it isn't for you", "You should be flying straight and level, never exceed a bank of 2.56 degrees" (no one actually said that one), but you get the point. I am glad I decided to make my own decision and not listen to the peanut gallery.

I decided to go for it and signed up for an aerobatic class at Chandler Air Service in the Great Lakes 2T-1A-2. Chandler Air Service and my instructor Lary Leadford were both spectacular. I highly recommend them if you are in the Phoenix area.

Flight One: I admit the first time I strapped myself into that small tubular steel cockpit, I was second guessing what I got myself into. The front seat of the Great Lakes isn't the most comfortable for a taller guy like myself, but it worked. My nervousness had dissipated as we took off and headed towards the aerobatic area. We started out with some dutch rolls, slow flight, stalls, and steep turns to get familiar with the airplane. We then proceeded onto some aileron rolls and loops. This was the first time I had ever been upside down in an airplane! Although it was a bit nerve racking, it was a feeling that can't be described until you have experienced it. Fun and exciting is an understatement. At the end of the lesson we finished off with some spins. A bit scary to be spinning towards the earth in an airplane, but very fun once you have done a few.

Flight Two: We started out with some aileron rolls and loops. Next up was hammerheads – what a blast! This is one of my favorite aerobatic maneuvers. We did some more spins, left and right. Spins felt like no big deal anymore. We finished out with a few snap rolls, one of the quicker and more aggressive maneuvers.

Flight Three: Again, we started with some aileron rolls before transitioning into some loops and hammerheads. I had asked to do some falling leaf stalls, as I had heard about this maneuver from several other pilots. Believe it or not, I thought this was one of the best maneuvers I experienced during my training. Being able to see that you can keep the airplane in a stalled condition, keeping it coordinated with the rudder, and never enter a spin was a very eye opening experience. We let the wing drop significantly multiple times to demonstrate that you could still level the wings with just the rudder. Pretty amazing. Next was the half cuban eight followed by some snap rolls. The half cuban eight was the first time I felt like I was really hanging from the four point harness.

Flight Four: This was the only flight I took in the afternoon and it ended up being fairly warm and bumpy. We decided to take it easy on this flight. We did a few spins and aileron rolls before moving onto some slow rolls. My instructor demonstrated the slow rolls – definitely the most technical of the aerobatic maneuvers I had experienced in my training. This was really the only maneuver I wasn't doing on my own by the time I finished the course.

Flight Five: This flight consisted of loops, hammerheads, aileron rolls, slow rolls, inverted flight, and several spin variations – an accelerated spin, spin reversal, and a “hands off” spin recovery. We didn’t fly inverted for very long, but it was good experience and fun to look at the world upside down. Next up was spin variations - if a normal spin doesn’t wake you up, a spin reversal sure will! We started a spin to left and held in right rudder to recover, but instead of neutralizing the rudder we kept the right rudder in. The plane hesitated for a second before snapping into a spin to the right that was twice as fast as the original spin. The accelerated spin was simply a normal spin with aileron introduced, increasing the spin rate. The hands-off spin recovery consisted of a normal spin entry, letting go of the stick completely, and simply using the rudder to recover. The airplane wants to fly if you let it!

Flight Six: The last flight. We reviewed most of the previous maneuvers and added vertical rolls, split s’s, cloverleaf loops, and a skidding turn into a spin (trying to simulate a base to final spin). Vertical rolls were one of the more technical and disorienting maneuvers, while the split s was a simple maneuver that pulled quite a few g’s. The cloverleaf loop was one of my favorite maneuvers alongside the hammerhead. The last maneuver we “tried” was a skidding turn into a spin. To my surprise, it was not easy to get the Great Lakes into a spin this way. Again, the airplane wants to fly, it doesn’t want to spin!

Although it was a separate experience, it is worth mentioning that I also had the opportunity to fly with a fellow hangar neighbor – a twenty year F-16 pilot (now a Southwest Airlines Captain) – in his RV8. This thing was a rocket ship. We did most the maneuvers in the RV8 that I had done in the Great Lakes. The roll rate was much faster in the RV8 and the visibility that the sliding canopy provided was exceptional. To date it is one of the coolest life experiences I have had. I want an RV8 now...

My day to day flying in the Cherokee has changed tremendously. I have found a new level of comfort in every phase of flight. I have learned to be assertive with the airplane. Fly the airplane. Look outside. The front seat of the Great Lakes had an airspeed indicator, an altimeter, vertical speed indicator, and an oil pressure gauge. That's it. You learn to fly the airplane by feel and by looking outside, not in the cockpit. My comfort level in turbulent conditions has risen and my patterns are much tighter and cleaner. I'm not afraid to bank more than 10 degrees in the pattern anymore. I had always been timid in the pattern, because I didn't want to be the guy who spun his airplane into the ground on base to final. Turns out my lack of understanding was causing this fear. I have had some incredible flying experiences in these past few months between flying the Great Lakes, RV8, and my own Cherokee 140. One thing is for sure, this won't be my last “aerobatic rodeo”. I will go back for more training - maybe someday own an aerobatic airplane. Who knows, maybe someday fly some competitive aerobatics for fun.

If you are a new pilot, struggling to find complete confidence in your flying, I highly recommend taking an aerobatic course. It transformed my understanding, confidence, and flying abilities in so many ways. Next stop: Instrument Rating and Tail wheel Endorsement!

Magazine article <https://www.iac.org/files/magazines/SA-2017-08.pdf>



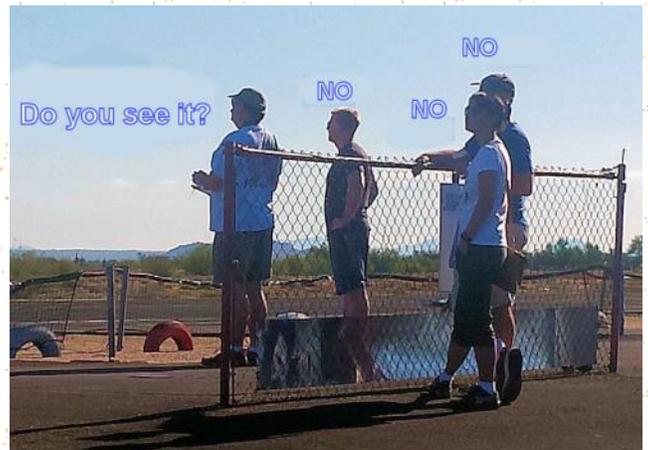
SVF People Are Funny!



Kenny please get your train off the field



My knees are hurting! One more time Charlie



Do you see it? NO NO NO



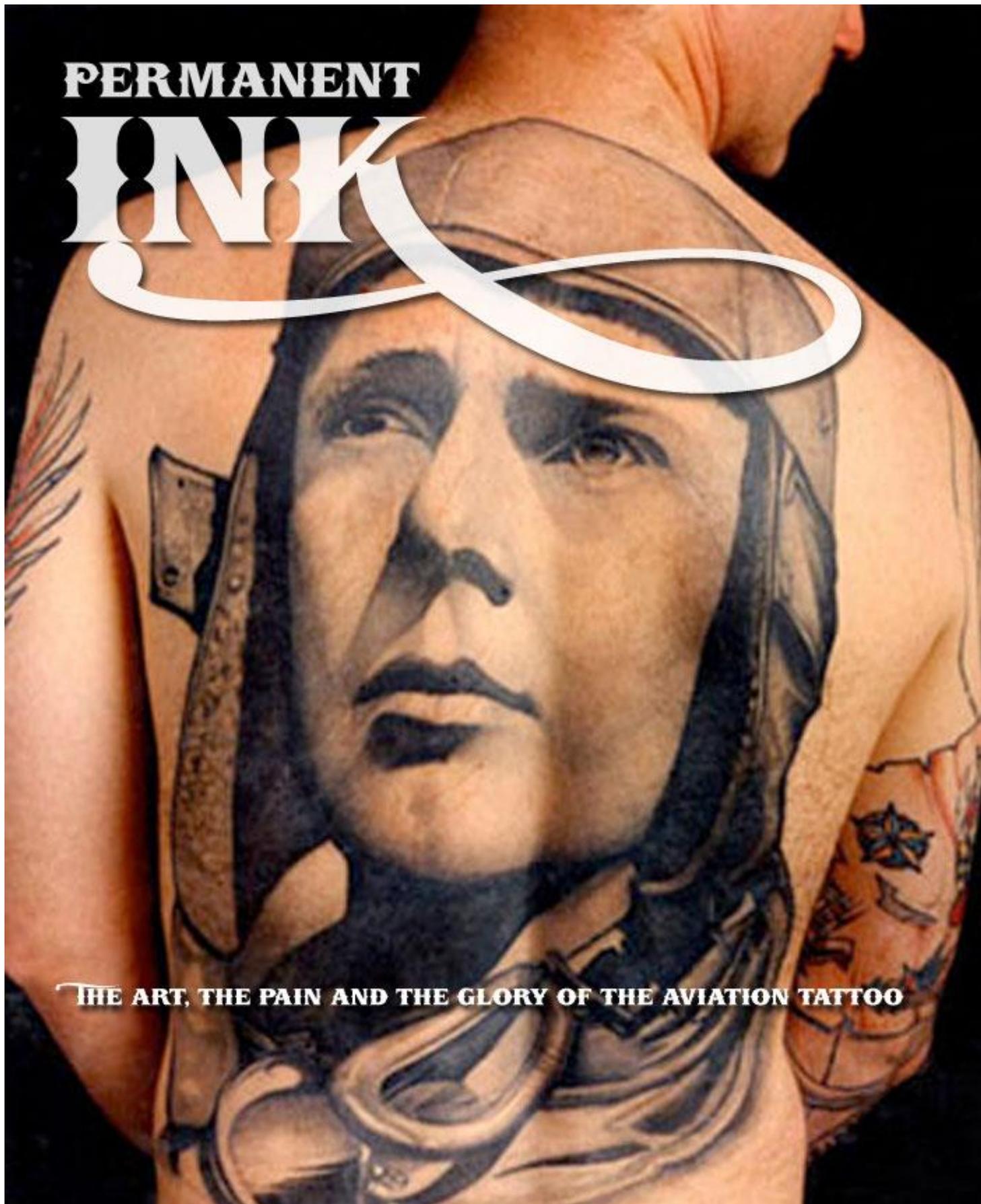
Where is it!



It's a bird! Now you tell me!!

PERMANENT

INK



THE ART, THE PAIN AND THE GLORY OF THE AVIATION TATTOO

<http://www.vintagewings.ca/VintageNews/Stories/tabid/116/articleType/ArticleView/articleId/372/Aviation-tattoos.aspx>

RC Spread Spectrum Demystified

Written by David Buxton

An overview of the inner workings of 2.4 GHz technology

Technical

As seen in the February 2015 issue of Model Aviation.

Go to a regional fun-fly or national event to watch airplanes and helicopters fly without the need of a frequency board. You have to wonder how it works. Is it true that the full 80 MHz wide 2.4 GHz band can support as many as 200 airplanes? If you are like me, you are not willing to accept that several radios can share the same frequency until you understand how it's done.

This article has evolved considerably—woven with popular theories and explanations that each were found to be incorrect. Too often, the correct information is buried in theoretical formulas that few of you would care to understand. The objective of this article is to present the theory of how our RC radios work in an easily understood format.

Manufacturer	Marketed Technology
Futaba	FHSS
Futaba	FASST
Spektrum/JR	DSM
Spektrum/JR	DSM2
Spektrum/JR	DSMX
JR	DMSS
Hitec	AFHSS
Turnigy	V1
Turnigy	V2
Airtronics	FHSS-x
Wi-Fi	

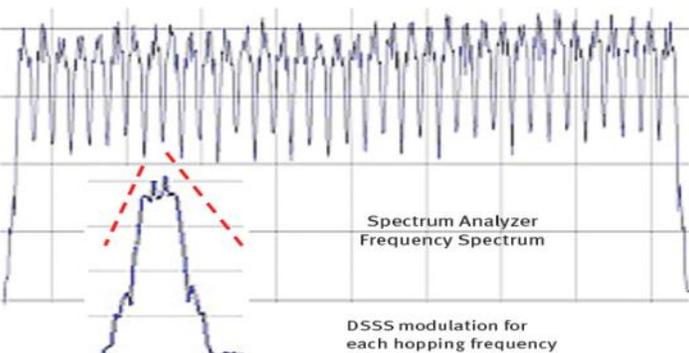
2.4 GHz Spread Spectrum

The following are three important technologies used by our 2.4 GHz band radios. It is a frequency band that is increasingly popular for a growing variety of commercial products:

Frequency Hopping Spread Spectrum (FHSS): Transmitter and receiver hop in unison to a mutually common pseudo random sequence of frequencies. One or more packets of data are transmitted before each hop.

Direct Sequence Spread Spectrum (DSSS): Digital sequence modulation applied to the carrier frequency. It looks like noise on a spectrum analyzer and is the recommended form of modulation used by FHSS for transmitting data.

Cyclical Redundancy Code (CRC): A key premise is that data sometimes becomes corrupted. The transmitter's and receiver's CRC calculation won't match if one part is slightly off. RC receivers ignore flawed packets, but Wi-Fi asks for a retry.



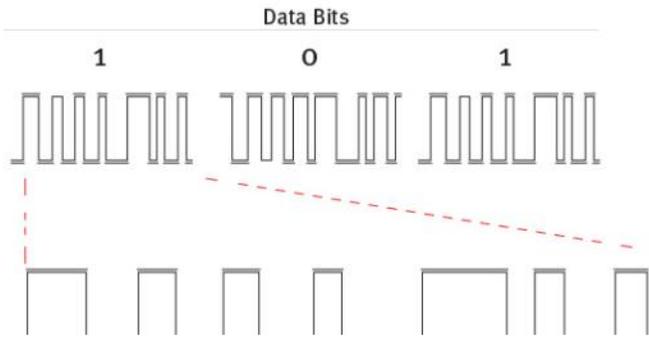
Futaba's first 2.4 GHz RC radios started out with modulated FHSS, and later models added DSSS, which was introduced as Futaba Advanced Spread Spectrum Technology (FASST). Spektrum's DSSS-only system (no hopping) was introduced as DSM, which was later enhanced with hopping frequencies called DSM2, which was followed by DSMX.

CDMA

Code Division Multiple Access (CDMA) is the DSSS technology used by our RC radios. It is designed for several radios on the same frequency. Figure 2 illustrates how each data bit is expanded using several encoding bits. Note that the encoding pattern for a '0' data bit and a '1' data bit are mirror images of each other.

80 MHz wide 2.4 GHz band 36 frequency hopping channels.

Figure 2: A direct-sequence CDMA encoding pattern.



The higher the ratio of coding bits for each data bit, the better the DSSS process can extract data from noise. The ratio is referred to as process gain (which will be illustrated and explained later). RC radios use a higher process gain than Wi-Fi. Both DSSS-encoded signals can travel as far, but our radios can extract clean data packets at a greater distance than Wi-Fi. Here are three process gain examples that help explain a key benefit of DSSS:

Most (perhaps all) Wi-Fi uses a process gain of 11. The range is roughly 850 feet outdoors.

Transmitters use 64-bit CDMA codes. Range can be up to 2 to 3 miles or more, depending on factors such as power output.

GPS (not 2.4 GHz) has a process gain of 1024. Satellite altitude is 12.6 miles and the distance is farther

near the horizon. GPS satellites use a common frequency for the 24 to 32 US satellites that employ different DSSS codes without frequency hopping.

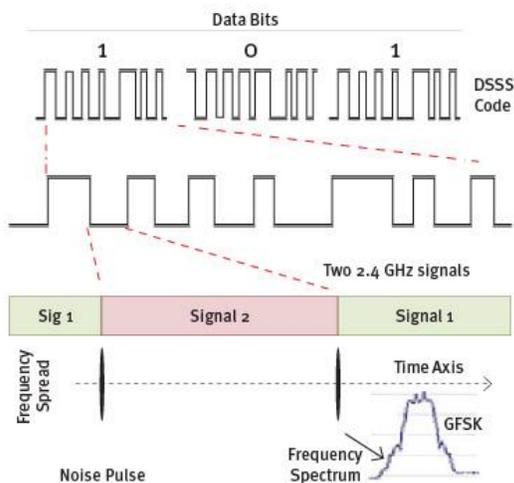
Communicating Edges

It is important to understand that CDMA communicates the edges of each coding bit and not the high or low levels. This section will help you understand how it works. Those with an electronics background understand the relationship between rise time and bandwidth. The faster a signal shifts from one level to another—the wider the spread of harmonics and the wider the bandwidth.

The same thing happens if a signal shifts between two frequencies or shifts between two phases (e.g. 180°, 90°) of the same frequency. The faster the shift, the wider the spread spectrum's bandwidth. There are spread spectrum shift key technologies that accomplish CDMA edge modulation by shifting between two frequencies—two or four phases or amplitudes.

Figure 3 illustrates shift keying. Each rapid shift results in a narrow pulse of spread spectrum energy that looks like noise with a frequency response spread as seen on a spectrum analyzer.

Figure 3: Shift key modulation.



Most of our RC radios use Gaussian Frequency Shift Keying (GFSK). Gaussian specifies the type of shaping filter used to translate the shift keying into spread spectrum. The Gaussian filter optimizes performance while reducing the bandwidth. In this case, less bandwidth can be a good thing.

Receiver Decoding

The CDMA illustration (Figure 4) is applicable for the different forms of shift keying. A multiplier circuit is fed with a pattern of 0s, 1s, and -1s timed by the DSSS code series used by the transmitter. Figure 5 uses an illustratively short DSS code.

Figure 4: Decoding phase modulation data.

Most of the time, the incoming signal is being ignored because it is being multiplied by zero. Two radio systems out of sync with each other will not "see" each other. A phase lock loop (PLL) plays a vital role in keeping your receiver's 2.4 GHz clock in sync with your transmitter's clock. The PLL acts like a flywheel to keep the receiver's

clock on track until the next edge is detected. The PLL speeds up or slows down to accommodate Doppler shift.

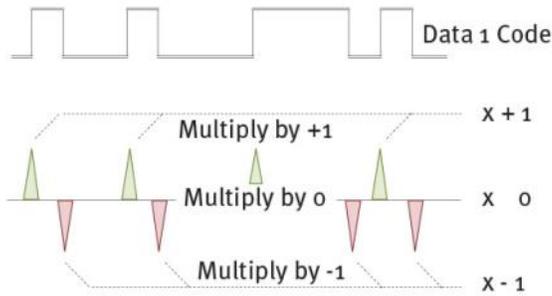


Figure 5: Translating code bits into data bits.

The output of the multiplier circuit connects to an integrator that accumulates the sum of each edge. The longer the series of coding bits, the higher the staircase will rise or descend for a final determination at the end of each data bit series. A successful decode is accomplished as long as the final summation is correctly positive or negative.

The crude simulation in Figure 6 uses a 64-bit DSSS code and noise that is more than 200 times stronger than the signal.

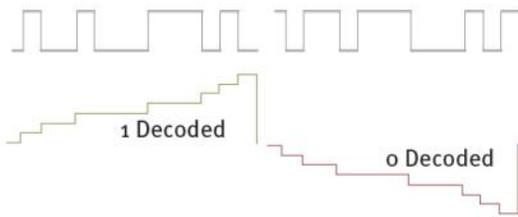


Figure 6: DSS code with noise simulation that is more than 200 times stronger than the signal.

The number of bits in the DSSS code pattern is referred to as process gain. Increasing the gain increases your receiver's ability to lift your transmitter's faint signals out of the noise at a considerable distance.

It also helps to separate your radio's signal from that of other radios that may have hopped to your radio's current frequency.

CDMA timing and process gain make it possible for several radios to share the same frequency. This explains why 2.4 GHz microwave ovens and basic Wi-Fi are not a threat.

There are 2.4 GHz commercial products that can menace our radios. One of the most threatening examples is a high-powered 2.4 GHz non-spread video link using a high-gain or narrow-beam antenna. A growing number of imported products are advertised as exceeding FCC regulations. These threats are the compelling reason for FHSS.

A Closer Look

This section, with its superficially explained alphabet soup, is for those who would like to dig deeper than this article. These are the integrated circuits (ICs) that our radios use:

Micro Linear ML2724 used by Futaba FASST.

Cypress CYRF6936 used by JR/Spektrum's DSM, DSM2, and DSMX.

Texas Instruments CC2500 used by Hitec, Corona, FrSky, Tactic, Futaba S-FHSS, and Wi-Spy's USB spectrum analyzer.

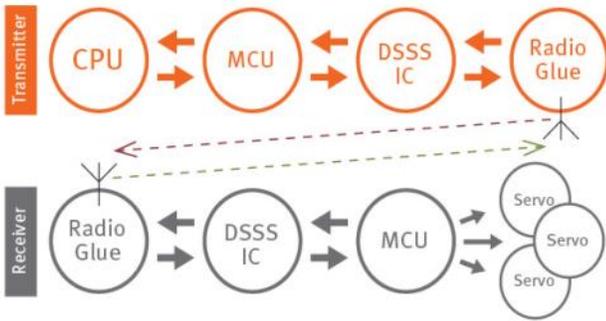
Texas Instruments CC2520 used for JR's DMSS.

These are ICs designed for commercial applications. The radio manufacturers' patented features are coded into the central processing unit and microcontrollers, such as the example in Figure 7. The first three ICs listed use GFSK modulation and are used in consumer products such as cordless phones, wireless keyboards, and game controllers.

Figure 7: Micro controller unit DSSS integrated circuits.

Some model aviation enthusiasts use these ICs to build and program their own radios. Some participate in the FrSky open-source project.

What We Have Learned



Our radios use FHSS, which is modulated using DSSS, which is modulated using CDMA, which is modulated using frequency or phase shift keying. DSSS provides a robust way to increase the distance at which our aircraft can fly in spite of noise. DSSS is also designed to accommodate several radios on the same frequency.

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To Libya and Back: Inside a Stealth Bomber Strike Against ISIS

During the dying days of Obama's administration, U.S. B-2 Spirit bomber crews executed a 32-hour sortie against ISIS. This is how it happened.



By [Joe Pappalardo](#)

Feb 8, 2017

An MQ-9 Predator soars high above the camp, the camera in its sensor ball fixed on the Islamic State fighters below. The foot soldiers are unloading rocket-propelled grenades and artillery shells from the backs of pickup trucks, likely unaware of the American unmanned aircraft overhead. Still, their fear of prying aerial eyes is noticeable as they stretch tarps across vehicles to obscure their shapes from above.

This ISIS encampment is one of several in the desert southwest of the Libyan city of Sirte. Late last year, U.S. warplanes helped local forces drive ISIS from the city. Some of those fighters have re-

grouped in these camps, others have gathered here from elsewhere. There are more than 100 Islamic State fighters spread across these sites.

It's mid-January and the presidency is days away from a change in administration. The U.S. ended combat in Sirte a month earlier. Now, ISIS fighters are regrouping in a familiar place when they feel safe from U.S. intervention.

They are mistaken.

Half a world away, "Scorch" climbs into the cockpit of a B-2 stealth bomber.

He's got a tough job, in some ways tougher than what's facing the pilots who will fly the actual mission. Scorch needs to prep the airplane for the strike at the Libyan ISIS camps, some 5,700 miles away.

It will take about 32 hours to fly from Whiteman Air Force Base in Missouri to the target in Libya and then return home. The pilots doing that need all the rest they can get. To trim the mission time, other B-2 pilots like Scorch assist with flight planning, weapons pre-checks, and sometimes even starting the engines.

"Of all the pilots on the base, 75 percent knew about the mission or were part of it," Scorch tells PM. "The others had no reason to know and had to find out about it like everyone else—from CNN."

"EVERY B-2 PILOT ON THE BASE WANTED TO GO ON THIS MISSION."

The Air Force does not disclose the names of pilots, and does not allow those in the cockpit to discuss the strikes themselves. But Scorch (who earned his callsign due to an incident with an overheated B-2 engine) and others at the base and within Global Strike Command agreed to speak with *Popular Mechanics* about how a globe-spanning airstrike is planned and executed.

"Every B-2 pilot on the base wanted to go on this mission," Scorch says. "Myself included."

Year One: Inside the Air War Against ISIS

The mission is easy to describe, but hard to execute. Two B-2 Spirit bombers, each with two people in the cockpit, will take off, fly to the target, drop enough bombs to eradicate the ISIS camps, and immediately fly back home to Missouri. Things get more complex as planners weigh in on everything from the pilot's diets to the size of the bombs loaded in the airplane.

"It takes a symphony of people," says [Major General Scott Vander Hamm](#), assistant deputy chief of staff of operations at the Air Force headquarters and a former B-2 pilot.

The intelligence staff of U.S. Africa Command (AFRICOM) has been monitoring the ISIS camps for weeks before the White House gives them the go-ahead.

While working out the finer diplomatic details, the military continues planning. "There are times when the President says, 'This is what we want. This is the objective, tell us how you could do it,'" Vander Hamm says during an interview with PM days after the strike. "That was the case for last week's flights."

Gen. Thomas Waldhauser, AFRICOM commander, chooses the B-2—an odd choice. The stealth bombers are built for a Cold War mission: to evade radar and drop bombs (even atomic) and get out undetected. No one in Libya has sophisticated anti-aircraft to threaten U.S. aircraft, so the stealth is not necessary.

But a bomber *is* an absolutely essential part of the equation. Nothing else can drop thousands of pounds of explosives on targets at the same time quite like a bomber. The U.S. bomber fleet includes non-stealth B-1s and B-52s, but it's the B-2s that can loiter for long stretches. Just because the B-2 can stay over a target doesn't mean

the pilots want to. "We are versatile," Scorch says. "But it's always in the back of all of our minds to get in and get out."

The targets define what aircraft flies the mission, and 500-pound bombs are all that is needed to take out a collection of mud-walled buildings and unarmored vehicles.

The weapon loaders can mix and match smaller and heavier bombs, but Vander Hamm says the Libya mission B-2s carry a "homogenous loadout" of 500-pound bombs. The B-2 can carry 80 of these 500-pound bombs, each guided to detonation with GPS coordinates. Each of the bombs can be programmed to hit a specific target, at a specific altitude, from a specific angle, at a specific time. "These were pretty tight shot groups, and the B-2s could attack them on a single pass," Vander Hamm says.

Although the targets are pre-programmed, B-2 pilots also program coordinates from the cockpit. Nearly every training sortie includes some on-the-fly retasking of weapons. Vander Hamm, who served as a B-2 pilot, says he once received a last-second orders to spare a target in Iraq that was providing the coalition with signals intelligence.

EACH OF THE BOMBS CAN BE PROGRAMMED TO HIT A SPECIFIC TARGET, AT A SPECIFIC ALTITUDE, FROM A SPECIFIC ANGLE, AT A SPECIFIC TIME

But this ISIS attack isn't a typical B-2 strike. Usually stealth bombers knock down defenses and allow other, non-stealth aircraft to strike undefended targets. Instead, these two B-2s will strike the camps, wait overhead for an assessment of the damage, and then retask their remaining bombs to hit anything that's still standing. In Air Force parlance, this mission will be two parts "deliberate" (pre-planned) and one part "dynamic."

"Hopefully we make it as vanilla as possible," Scorch says. "But even when there's nothing dynamic, nearly every combat mission I've heard of, there has been some changes."

Whiteman Air Force Base is the home of the B-2 bomber fleet.

There are only 20 of these stealth bombers in the hands of the U.S. Air Force arsenal.

B-2 bomber crews come from nearly every Air Force discipline. Pilots start their careers with other bombers. Some hail from the fighter community while others flew cargo haulers and tankers before coming to the Spirit. The cycle of training, maintenance, and rest comes to halt when the base receives a planning order. "That's the first time when we know something is happening," Vander Hamm says. The staff first selects pilots, then develops a concept of operations, reaches out to others involved in an operation like refueling tankers, and reports the options up the chain as high as the secretary of defense and the president.

Although this mission will only fly two B-2s, each with a two-man crew, many more are made ready to fly. "Two or three times that number are briefed up and ready to go," Vander Hamm says. "They go on dry runs in the simulators, show up for the tech ops briefings, mission plans, and get on crew rest."

These pilots are more than understudies. As the mission's takeoff time creeps closer, these backups will take on portions of the planning and preparation to enable the actual pilots to prepare for the rigors of a long duration flight.

"The sooner we get the tasker the better it is," says Maj. Danny Elich, a medical services flight commander for the 509th Bomb Wing and an aerospace physiologist. "We can start reshifting the crews and synchronizing their circadian rhythms."

These long flights play hell with the pilots' sleep and waking cycles. There are also issues with dehydration, deep vein thrombosis, and fatigue. To combat this, the physiologists at Whiteman plan their own version of the mission, including snacks and nap times that preserve the two-man crew for the moments of intense concentration. They also recommend, and sometimes require, the use of "go pills" (often Dexedrine) or "no go pills" (something akin to Ambien) to enforce the rest cycle as a last resort.

Long-range bombing missions include equally long lulls in the cockpit, an experience far removed from comfy first-class flying.

Behind two seats is a 6-foot flat space where pilots can set up a cot to sleep. Behind the right seat is a crude toilet—a stainless-steel bowl with no walls—not too far from a bank of classified communications servers.

But these long flights also come with too much free time, which can lead to stress and nerves. Most pilots try to use the time constructively. "On the way out you're worried about getting your tactics right," says Scorch. "I try to use the time to study, to brush up on the mission. I also get up from the chair as much as I can, do pushups or exercises."

Others use the time to reflect. "You go over it," Vander Hamm says of his combat missions. "Am I right with God, my family, my life, and my will?"

Eventually, it's time to refuel. The B-2s meets KC-135 Stratotankers at least twice on the way to Libya. It's a coordinated dance that must occur no matter what the weather or time of day. The airplane in need of fuel flies directly behind the tanker. The tanker then extends a telescoping fueling boom. The end of the boom—the fuel nozzle—latches into a small hole in the receiving aircraft, and the fuel pumps as the conjoined aircraft fly in harmony.

The B-2's fuel port is on top of the fuselage, so a pilot can't tell how close the boom is to the bomber's receptacle. They watch lights under the tanker plane's fuselage that tell him to move forward, left, or right. Once the connection is made, a dashboard screen says "LATCH" and the fueling begins. As thousands of gallons of flow, the B-2s flight control computer routes it to the appropriate tanks as a way to preserve the bomber's center of gravity.

Then it's back to the long wait as two B-2s inch closer to their Libyan targets. "The stakes are really high," Vander Hamm says. "You can't train for that piece."

The deadly math of this airstrike requires two B-2s to release around 500-pound bombs to on the first pass.

With 80 stacked and ready in each bomb bay, both B-2s will attack the target and have bombs to spare if anything is left standing.

Bombing runs are preprogrammed events—all part of the flight plan. The bomber calculates the time of release at the particular airspeed and automatically opens the bomb bay doors to release the weapons from either a rotary launcher or a bomb rack. "We can drop within a few feet of a target, if not right on it," Vander Hamm says.

Over Libya, southwest of Sirte, the B-2s approach the targets. The B-2s open their bomb bay doors and the 500-pound bombs pour out. The big jet lurches as several thousand pounds of cargo is jettisoned in seconds. The bombs fall away without an explosive mechanism—gravity alone takes them from their assembly in the bomb bay. The airplane determines the airspeed, air density, and parameters that influence the drop and times the release.

Below the dark bombers, the ISIS fighters don't have any warning as thousands of pounds of explosives sails their way from above. At least one Predator is nearby to record the impact—a cacophony of overpressure blasts, roiling smoke and dust, and secondary explosions.

Dozens of ISIS fighters are killed. The Pentagon later gives a final tally at around 100.

The B-2s stay on station, waiting to hear word from AFRICOM of new GPS targets to program. The battle damage assessment is made. The Pentagon later indicates that the Predators fired a few Hellfire missiles at ISIS survivors, but the camps are devastated.

"There were a lot of eyes watching for activity," Vander Hamm says. "But one pass was enough. And so they were sent home."

The way back has its own risks, fatigue chief among them.

The adrenaline of the bombing fades quickly, and the 18 hours back can be harder than any other part of the mission. "Now it's quiet and you have two or three hours until you even see a tanker," Vander Hamm says. "This is generally the time when pilots have a tendency to get tired."

But there are two refueling encounters to go on the way home. By the time these happen, the pilots are eager to get home, get into U.S. airspace, and get the hell out of that cockpit.

Thirty-two hours after takeoff, the two B-2s land at Whiteman base, now filled with airmen and personnel that've heard about the strikes on television, while in Washington D.C., [the Pentagon is briefing reporters](#). "This was a group that had plans. And that's why we struck them at this particular time," spokesman Peter Cook says, noting that the attack was coordinated with Libyan Government of National Accord. "This has been a discussion for some time as we've kept an eye on these particular camps."

Pilots and others at the base meet the crew, and not to just shake hands. They carry gear, help stow the jet, and do anything to help the exhausted pilots, who now face post-mission briefings with flight docs, commanders, and the crew chief.

The physical effects of long-duration flights are debilitating, even with a cadre of well-trained, experienced fliers. "There have been times when you had to pour me from that cockpit," says Vander Hamm, who flew 38-hour sorties in combat.

But finally the mission is over. Concerned crew chiefs scrutinize the bombers from the insides of the engines to the stealth coatings on the surface. The pilots are reintegrated into the squadron's sleep and rest rhythms—these pilots must always be ready to fly, as part of the nuclear triad as well as unexpected conventional bomb missions. Whiteman returns to relative normal, airplanes, crew, and commanders at the ready. The cycle re-

sumes.

But sooner or later—whether weeks, months, or even years—the next planning order will come, and the B-2s and its crew will <https://www.youtube.com/watch?v=J-7nkk6YQBU> be



A Sunday In August





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Inside this issue: Cover Photo by Bob Purdy ...Prez report...Meeting Minutes..... B'Days & Treasurer Report....SVF Members photos ...SVF SWAPMEET...Field Cleanup Photos.....IMAC Photos..... OEAF Photos.....Holy Toledo, already? ...P-51 Story...Kent Walters article.....Wings AZ.... ELECTION BALLOT VOTE!...Dessert at May meeting...6-4-08 NEW SVF MEETING Place....**THE BIGGEST SLOW ROLL YET!**



Will we ever see these women again?

What are the girls from Sheriff Joe's chain gang looking up to? See photos inside.

Editor; The men did a better job and didn't wear chains



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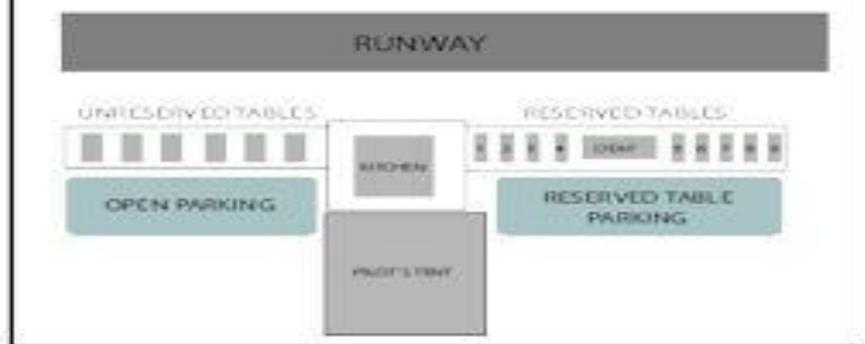
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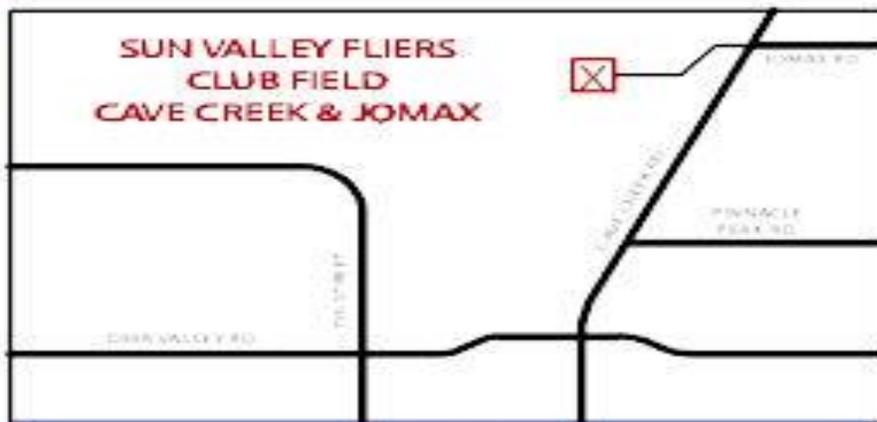


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My thanks to those who passed this info on.



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First name	Last name	Member type	Dob
Bryce	Hatfield	Regular	09/01/1963
Craig	Early	Regular	09/01/1954
William	Jenkins	Regular	09/03/1964
Oliver	Heinen	Regular	09/05/1975
Ronald	Petterec	Senior	09/05/1945
Gene	Peterson	Senior	09/08/1942
Arthur	Gambino	Regular	09/08/1958
Bryce	Hatfield	Regular	09/10/1963
J B	Bowers	Senior	09/12/1941
Bryant	Mack	Regular	09/14/1997
Jack	Dolan	Junior	09/15/2001
Stephen	Myers	Senior	09/21/1946
Carlen	Cyphers	Regular	09/22/1993
Debin	Ray	Regular	09/22/1982
Gavin	Sichewski	Junior	09/23/2004
Barry	Mazer	Senior	09/24/1949
Stephen	Quill	Senior	09/27/1946
John	Serio	Regular	09/27/1976
Wayne	Robinson	Regular	09/29/1956
Vince	Perko	Regular	09/30/1966
Derek	Micko	Regular	09/30/1976



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