

Energy Management

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Well, with the new found interest in this topic particularly with those flying Normal Flight Mode, I thought I'd go ahead and start posting on the topic. First off, none of this is original material. It is based on my own training, reading of many, many books, outright copying of several excellent sites on War Birds and Air Warrior and most likely sources I no longer even remember. Where possible I will try and cite the original source. A lot of this isn't from just one source but many. I will try and add my experience as well as others as it pertains to Red Baron.

1.) What the hell is Energy Management and why do I care?

Well, first let us define Energy. Its simplest definition is that energy = altitude + speed. That is the classic definition. I, however, feel that angles are a key component rather than a separate component of Energy. In a dogfight you trade each of these components for the other. The pilot who best handles these tradeoffs will be the victor. In a dive you trade your altitude and ability to turn (angle) for superior speed. In a hard bank you increase your angle at the sacrifice of speed (and sometimes altitude). It is an ever increasing trade off. Energy Management is the ability to handle these trade-offs in such a way as to get yourself a killing shot on your opponent.

2.) Isn't "Boom n' Zoom" Energy Fighting? Boom n' Zoom is usually visualized as a higher plane diving on a lower plane, taking a shot, and then zoom climbing back up to alt. This is a tactic that uses Energy Management in a simple form but ALL dogfighting is Energy Management. Boom n' Zoom is but one tactic of many.

3.) What are other tactics? I will cover specific tactics later. Some that will be covered are high yo-yos, low yo-yos, reversals, lead turns, guns defense, turn circle geometry and merge tactics.

4.) OK, then what else ya got? Well, for instance, why is Energy Management important? It is important because the aircraft with more Energy is the aircraft that dictates the fight and has the option of the initiative. Seizing the initiative puts you on the offensive. If you are on the offensive your opponent is on the defensive. If he is on the defensive, he isn't getting a shot at you. It's that simple.

The keys to good Energy Management are:

a) know your aircraft and its relative energy state at all times.

What I mean by relative is that it can be just as deadly to be high and slow as it is to be low and fast. Many times the low and fast plane actually has the better energy state.

b) Learn to recognize your opponent's relative energy state.

The best way to do this is to learn the strengths and weaknesses of the enemy aircraft.

c) Know what aspect of energy (angle, speed, altitude) is the best for your aircraft.

Altitude is the one you control by pre-positioning in a fight. If you are entering a fight too low, turn around, fly away and come back higher. The other two characteristics are more determined by your aircraft type. Some planes have a better angle component (DrI or TripeHound for example) while others have a greater Speed component (Spad or Se5a). Don't try to

turn fight a DrI with a Spad. You will lose. Likewise a DrI won't outrun a Spad.

5) Great grasp of the obvious Sensei, teach me something I don't know.

Patience Grasshopper, just laying the ground work. Here a few definitions you will need to know so that we all talk from the same reference point.

Turn Radius: How big a circle I carve in the sky while turning.

Turn Rate: How fast I traverse my turn radius.

Cornering Speed: The speed at which your aircraft has the highest turn rate in the tightest turn radius. This is not your slowest airspeed, however. It is true that the slower you go you will turn a tighter radius, however, it is your turn rate that will determine how fast you bring your nose around. Rate kills...

BFM: Basic flight maneuvers, i.e. climb, dive, bank turn, rolls etc...

Turn Circle: The circle I am carve out while effectively performing offensive BFMs.

Lead Pursuit: Pulling the nose of your aircraft in front of the nose of the target in front of you so that your bullets will hit the enemy and kill him. It gets bullets on the enemy but it is going to cost you your speed component and quite possible your altitude component. It is a pure angle component maneuver.

Lag Pursuit: Keeping the nose of your aircraft slightly behind the tail of your enemy. This allows you to stay on their 6 without expending your speed component for angle. You do this while you want to keep your energy up and wait for the bad guy to make a mistake.

Part II

This section will cover a classic merge of two aircraft. In this case we will look at the scenario where you have a significant energy advantage over your opponent. In general, this will usually mean you are higher than your opponent.

OK, you are tooling along at 7,000 feet and lo and behold you see an enemy loitering around 6,000 feet. For our Metric enhanced fliers make that 2.5K meters and 2K meters. :-) "Easy Meat" you think and dive straight down on him as he approaches you. This will be sort of a head-to-head battle and you expect to kill him/her in the first pass or at least damage them heavily. You notice as you begin your dive you started a bit too soon. Uh-oh, he pops up a bit nose high and fires back at you, you pull up to regain and he hangs on his prop for a belly shot. Now you are the one damaged. Or maybe he angles up slightly to his left and then hard rudders over to his right. You try to follow but can't because of your high speed... Congratulations on quite possibly giving your opponent his first kill!

The first mistake you made was not determining the true energy state of your opponent. Maybe you had more but the key was you didn't make sure he didn't have any. Simply having more Energy doesn't guarantee a win. You must learn how not to squander it.

Let's take the classic Energy tactic of Boom and Zoom and go over some examples of common mistakes pilots make trying to do it. Some of this is taken directly from Bullethead's excellent article on Energy tactics. I'll make changes accordingly for WWI aircraft.

Mistake #1: Over-extending in the Horizontal. What is that again, and this time in English please?

OK, you dive down on the bad guy after making him do several high-G turns and bleed his energy. You zoom back up and extend away setting up for your next pass. Only you extend too far and by the time you turn around to setup again all that hard work of getting him to burn E is gone because he has regained it. Basically, you took too long and now you have to start over. If he is really good he even climbed a little while you were extending and now your E advantage is less than it was before.

Mistake #2: Under-Extending in The Horizontal

Allrighty then, the first guy escaped because you went too far so now you are going to compensate by dancing on the head of your opponent. Your in a D2 and he is in a N17. You climb better but he can out turn you. You dive down on him and force him to turn under you. In doing so he bleeds E and you Zoom back up, only instead of extending a bit to let you line up, you stay right on top of him. Suddenly, you notice he is making low G turns to stay right under you and you are having to turn hard to try and line up on his 6. Now, at this point you either get impatient and make a really bad dive for a low percentage deflection shot or you end up turning so hard you bleed your E and have to level off to speed up or even dive down. The enemy sees this and uses the opportunity to gain another 50-100 feet in altitude and you've just lost some E advantage.

Many people forget that their high speed dives mean their turning radius is going to be greater than that of your slower opponent. Suppose you are in a poor turning aircraft like the Halb and you are diving on a better turning aircraft like the N11. You keep pulling hard on the stick while on top of him to line up for a 6 shot and draining all your E. You then force your attack and your opponent breaks a hard right turn. Since you are flying a high wing loaded plane (slow turner) and you have greater speed, your turn radius is

greater. Your enemy turns inside of you and next thing you know your butt is getting filled with Lewis lead.

Mistake #3: Following more than one break maneuver

This is related to not extending far enough. If your plane is less maneuverable you want to lessen your close rate by being further out in order to need a shallower dive angle to attack. Once you start and your opponent makes a break turn you may be able to track them for a bit, but don't sacrifice all your speed and altitude components of energy for an angle component. If he turns better and gets you to follow him through more than one turn maneuver you are going to lose your alt and speed and get into a turn fight that he is going to win. This is readily apparent when pilots get fixated on an enemy. They get lined up great on the first pass and try to turn at high speed and watch helplessly as their speed drops off and their enemy comes around on their 6...

Mistake #4: Breaking low after a pass

OK, after your first 3 deaths you've learned to keep enough horizontal separation to make shallower dives attacks, but not so far that your opponent recovers E before your next pass. You also learned not to follow that DrI through turns in your Spad. You've made your opponent make several high G turns and you are saddled up for a great 6 shot. You dive and shoot him and then break low and left as he breaks to the right. You start circling around to your left and suddenly see that out of cockpit view as he got his head shot on you. You see after he started his break to the right he saw you break low left. A twist of the rudder and now he is diving onto your 6.

THERE IS NEVER A GOOD REASON TO BREAK LOW TO REENGAGE AFTER A GUN PASS. Period. Your high speed guarantees he will turn tighter anyway. Combine that with a plane that may turn better

anyway and you are really hurting. Note, I am talking about a low break for reengagement and not a dive pass where you keep going low to escape.

Mistake #5: The rushed gun shot

Now, you've hit Start New Life, got your alt again, and are approaching your enemy. You remember all your previous deaths and are determined not to die again. You find that perfect altitude and horizontal separation and force your opponent into a series of high G maneuvers while you try to line up a shot. Except, this guy/gal is good. They keep turning under you and blowing your line up. After 15 minutes of this you are getting frustrated as you are sure other bad guys are sneaking up on you. Finally, you think you have a shot so you dive in. Well, its a bad angle and you miss your deflection shot. But, what the hell, a good wing over and I can be back on his 6 and get so you force the maneuver. Only he has gone into a rolling scissors where you are criss-crossing back and forth or maybe you don't pull up in time and you get too low.

Well, your lack of patience has blown your advantage and now you are dead again. This is the most common death for new pilots.

Mistake #6: Lack of aggression

You do everything perfect and get lined up, only its not quite perfect or maybe there is something you missed so you hesitate. Good job, you just missed the perhaps one opportunity you had for making your attack. Before you know his buddies arrive and chew you a new one because you took too long.

Questions:

- 1) What is the proper horizontal separation for a classic BnZ?
- 2) Exactly how do I tell when the right time to attack versus attacking too rushed?
- 3) What if I see after his first turn that I can really, really get a good shot if I follow him through just one more maneuver?

Answers:

- 1) Experience. Get some air under your butt and fly different planes. Each combination of aircraft will require different numbers. Monos would have less distance obviously than say Camels and Albs. This is why it is important to fly BOTH sides of the airplanes so you get to know what the other guy can and cannot do.
- 2) You can tell simply by whether you get the kill or get killed. :-) Again, this just takes time and experience. There are no "secret moves" or magic incantations that will work here. You don't have a radar system for calculating your weapons envelope and giving you a tone when it's time to fire. You are equipped with nothing else but Mark I Eyeball and you need to learn to use it properly by practice, practice, practice.
- 3) And what is your home address for your personal effects? Go back and read the paragraph again.

OK, this post covered some common mistakes of a simply BnZ Energy Fight. The next article in the series will cover some things to do in this situation to better get the kill. Some of it will be repetition. In summary, maintain enough horizontal separation so that you can use low G turns to line up on your opponent while he is forced to make high G turns to get under you. Don't rush your shot, but when you see your chance to attack (you have energy and he doesn't) then do not hesitate to attack. If you don't

have the shot don't force it, don't follow the lower plane through more than one maneuver, and finally don't break low to reengage.

Part III

OK, in the last section we covered common mistakes, in particular to a classic Boom and Zoom fighter. Let me take the opportunity to reiterate that Energy fighting isn't always a BnZ technique. Energy fighting is about maintaining a total advantage over your opponent with respect to the three attributes or components of energy. Those three are altitude (potential energy), speed (kinetic energy), and angle (force vector). The pilot who is better able to retain the superior energy state of those three components will win the fight. Some aircraft are known to be faster than others or better turners than others. Those tend to be fixed attributes (max and min values I mean here) and altitude is the one attribute the pilot can really control. The key is in knowing how to balance the three in the right combination to make the kill.

Allright, so after dying from making those earlier mistakes in a positive energy merge you decide to saddle up and try again. Here are some techniques for using a superior energy state to defeat your opponent:

Zoom to The Wall: This technique is also called "Rope a Dope" by some. In this instance lets say you have a speedy plane like the Spad and your enemy has the DrI. The DrI has got the angle component all over your plane, but you have the advantage of speed. Combine that with your advantage of altitude and you start with the energy advantage. So, after a few maneuvers you have managed to whittle his energy away a bit and you can see he is not one of the masters of the DrI. You've worked your way behind his 3-9 line and dive at him. He stays straight on because he is trying to build up E again. You pass over him in an overshoot and he goes for the 6 shot. Realizing you may have screwed up you note you can zoom straight back up so you yank back on the stick. Because of your initial altitude advantage and

speed you zoom up higher than he can. He is fixated so he keeps following up. His initial low energy combined with the induced drag of a high angle of attack his plane falls off before yours does. Timed right you can hammerhead or wingover to line up for another pass at his plane. If he is low enough he smacks the ground. If he is high enough to recover he usually is wallowing for a few seconds allowing you to get in your shots.

A variation on this is the Slow Climb To The Wall. This is where you know your aircraft has an advantage in a climbing turn. You slowly make that turn climb watching your opponent knowing his airplane will stall before yours. When he does you nose over and deliver the killing shot. A great example of this is a Morane Bullet versus a Halberstadt in the Advanced Flight Mode. The Bullet can spiral climb to the left slightly better than the Halb. It is so close that the Halb will get a shot at you. The secret is that your Morane has a lower stall speed so you can turn a tighter circle than the Halb. If he attempts to turn as tight as you his stall will occur before yours. You'll take some shots but you will deliver the death blow. The E3 is actually harder to kill this way because while you still hold a left turn climb advantage he can turn nearly as sharp as you can. The good E3 drivers can hold that edge and not fall into the dreaded AFM left hand E3 death stall. The AFM Se5a and P3 also fall into this category. Which ever one of those gets into the higher position can pull the same maneuver (assuming no uber damage.)

OK, so how does the Halb pilot make the kill? Well, remember back in the early posts about trying to pull a lead turn and watching your speed drop off? This is the same thing only at a slower pace. Use a lag pursuit method and don't worry about always keeping your site on the target. Do lag pursuit for a couple of turns until you have the E for that snap shot. Widen your turns a hair so your turn radius is a little wider than the Bullet. You'll find that about every third rotation will present itself with a firing solution. This is energy fighting as well. Both pilots are watching their speed, trying to gain alt and either gain or give angle. That is what energy fighting is all about. It's not just Boom and Zoom.

Another problem you often run into is the pilot who continues to force the head-to-head shot. In this example lets assume your positive energy state is either from Speed or Angle and altitude varies very little. Every time you try and make a pass at the enemy he forces a head on. You might get the lucky engine shot or ahead shot but you may also collide. My most recent experience in seeing this was in a Dh2 versus a Halb in Normal flight mode. The Dh2 turns better than the Halb, speed is about equal and Halb had a slight altitude advantage (50-75 feet). In a flat, standard bank turn I could come around quicker but with his slightly higher alt he was able to rudder around and force a head-on.

At this point I had two options. 1) I could try and duck under his turn and go for an engine or cockpit shot. Doable, but my timing would have to be perfect and my aim perfect. Well, with these planes, the scatter effect and just plain ordinary internet lag that isn't likely. 2) This is what I did. I continued to force the head-to head-turns but rather than banking around I used a wing-over to reverse my direction.

A wing-over is a low E, no altitude loss of reversing 180 degrees. Now, what I mean by wing-over is I enter a 30-40 degree climb for about 2 seconds, roll to the left, pull my joystick down and left to the 7 o'clock position for about 2 seconds then push it over to the 5 o'clock position. The end result is I should be 180 degrees from my initial course. The same can be done to the right just reverse the directions. Done properly the alt I gained in my quick little climb (slight increase alt component), combined with the conversion into a quick turn (conversion of alt component for better angle) brought me around slightly quicker than my opponent. The advantage came from the fact that I lost no altitude in the end. I did lose a bit of speed, but since we were nose to nose it was less important. Each of his high rudder turns was causing him to lose a bit of altitude each time. After 3 or 4 of these maneuvers I was now 100-150 feet over him. I now held the advantage in angles (my turn was better than his), and altitude (100-150 feet, not much

but enough) and our speed was about equal. I was able to position behind him and take the initiative and eventually make the kill.

This example was more of a classic energy management battle than Boom and Zoom. I traded various components of my E management to slowly gain the advantage. I didn't rush the shot and waited until I held the advantage. Once attained I went for the kill.

What could the Halb pilot have done to prevent this? Well, if he had been watching and saw me do the wing-over he should have realized I was going to be slow coming out of the wing-over. He could have leveled off at that point and simply increased the horizontal separation and maybe even use the speed advantage to convert back to alt and negate my advantage. Another option was he could have used the speed advantage for a low G climbing turn that would have helped to negate my slight alt advantage. I could not have afforded to go for the angle on his climbing turn because my speed was too slow and I would have stalled my alt away trying to follow.

Remember, I was counting on him to use those rudders to come around and thereby lose alt. It wasn't that I was climbing as much as it was the fact I wasn't losing alt while he did. In fact, the next person I met did that exact thing. I kept doing the wing-over and he kept doing a low G climb turn. We were stalemated for about 15 minutes until planes from both sides showed up and all hell broke loose. :-)

In the end we both got away.

Overshoot Control: One last thing on attacking from a positive energy merge--overshoot control. There is no better way to blow an altitude advantage than to dive on an opponent, overshoot him and watch him fill your 6 with lead. There are certain things aircraft are equipped with for overshoot control. In AFM it is your throttle. Cutting throttle in AFM will cut your closure rate. In Normal with the Mach 2 dives you have to nose up to bleed your speed as cutting your throttle won't work. In AFM raising your nose won't work very well as it doesn't bleed E enough.

One technique I use (and is one I seen often from Camel jockey's in AFM) is a lag pursuit roll. A lag pursuit roll is where you are diving on your opponent and notice you are going to overshoot. You nose up and go into a wide barrel roll. You are converting your excess speed component for altitude in the roll plus angle in the roll (albeit the angle isn't one for killing). If he stayed straight you will end up on his six again. Chances are he won't stay straight but will bank in one direction or the other. If he does, make your barrel roll in the OPPOSITE direction and use aileron and rudder to line back up on him. This is an extremely effective technique.

One way I practice it is to find one of those aerodromes with the hangars run down one side of the drome and wrap around one end of the runway forming an "L". In this example let's assume the long row of hangars is on the right hand side of the drome and curve around the back of the drome to the left. To me it will look like an upside down "L". I'll dive, pretending each hangar is the new position of my enemy as I am diving. I'll dive lined up down the long leg of the "L" (down the side of the drome) when I get to the second to last hangar I will barrel to the right and use my rudder and aileron controls to come out of the roll lined up on the back row of hangars. I hope that picture is clear...

The high yo-yo is another technique to control overshoot and is the classic technique for an airplane with less turn ability to stay on the 6 of a plane with high turn rate. I will cover the high yo-yo in another post because it is more accurately an example of flight geometry more than overshoot control. In flight geometry we will cover things such as Turn Circles and Offset Turn Circles.

Part IV

The topic for this section is the Negative Energy State Merge. In laymen's terms this would be "I'm screwed, how do I get out of it?" A Negative merge means just that. You have merged with the enemy and he/she has an energy advantage over you. Most commonly, this occurs because they have more altitude. As you well know this can happen in a variety of ways. Another common scenario for a negative energy merge is that your opponent simply has a better plane than you do. Bomber pilots typically face this situation.

OK, so you are tooling along and suddenly a quick "E" check shows a bandit high over head by at least 1000 feet. In our example let's assume he is to our high 5 o'clock about 1000 feet up and 1000 feet back. In case you were wondering this is really, really bad--not a happy place. What do you do? Well, your first thought is to disrupt any potential easy line up shot you may be giving the enemy. The best way to do this is to turn and get directly underneath them. Why? Remember back to the common mistakes people make when they hold an energy advantage? One of the "mistakes" was failing to maintain adequate horizontal separation thereby forcing the Positive plane to perform High-G BFMs in order to line up. Well, if you are the lower aircraft you can force the issue by turning your plane and getting underneath the bad guy.

Back to our example--bandit is at high 5 so I react by making a hard right turn and....oops, I'm dead. What happened? The hard right turn is what happened. When at an energy disadvantage it is imperative you not blow any more E if you can help it. Make a right turn but do so at a minimum energy loss. Keep the nose level in your turn, make as tight a turn as you can without losing speed. Do NOT dive or turn hard because if you get slow the other guy will pounce and kill you. While making your turn you will have to keep an eye on him (F3/F8 view), your VSI and your speed. You will be flicking back and forth between all the views so having those joystick hotbuttons really helps here.

"But, Sensei, trying to watch all those things at once is hard!" So? Air combat is hard. In a negative energy merge you are already dead for the most part. You are going to have to do everything right to survive. That's just the way it is. Learn the skills it takes to survive and you will. If you are looking for a "quick trick" that will turn the tables go back to playing X-Wing vs Tie Fighter or watching Top Gun. What I am attempting to show here are the tried and true methods of surviving an encounter like this with the same techniques that have been taught to fighter pilots since WWI. This is a game where you can screw up and get a second chance the next time up. Many real life pilots never got a second chance.

So, you make a good right hand turn and now you are directly underneath the bandit. He had to abort his first pass because of your maneuver so now he attempts to re-position. Be aware he is going to try and get you to commit to high energy bleed maneuvers. Hopefully, for you, he will be so busy watching your maneuvers he doesn't notice his own. Keep your turns low, load, and stay underneath him. If you are able to make a really good low G turn take the opportunity to climb a bit. Grab alt whenever you can. **YOUR NUMBER 1 GOAL IS EQUALIZE THE ENERGY STATE.** I emphasize that because many people feel or look for a way to reverse the situation. That will only happen if your opponent really, really screws up royally and that seldom happens these days. One reason for grabbing alt is that you may need to reconvert it to speed in the event you do get forced into a high G turn.

Great, so you have managed to stay under him and he made a boom pass at you but only got a wide deflection shot that hit nothing. He is now zooming up to alt again on your 6. At this point, if he is indeed behind your 3-9 line you want to turn again to face him. When in doubt force the head on from a disadvantaged position. While you are turning around and he is climbing you do a small spiral climb as well. In fact, make it a habit of grabbing alt when he does. Don't over do it and yank back on the stick or your speed will drop too low, just grab what you can. During the fight it is important to remember that his goal is to **KILL YOU.** Your goal is to **KEEP HIM FROM**

KILLING YOU. Your goal is not to kill him. Believe it or not, in most cases there is more pressure on him to complete his mission than there is on you to stay alive.

The number one thing you can do to stay alive is to frustrate your opponent and make him/her make a mistake. If they have been denied a good gun pass 2 or 3 times they will begin to get anxious for several reasons: 1) You may have friends coming 2) After 2 or 3 passes, unless they have been extremely diligent, their altitude advantage is now less. Especially if you have been grabbing a foot here and there. 3) The "Thrill of The Kill" will cause an adrenaline rush in the attacker more so than the fear of being shot down. I'm not a doctor, I don't know why that is true it just is.

This leads to the most important combinations of things you need to keep in mind--Patience and Calm. Be patient! Wait for that dive that goes too low, or the rushed gun shot. Go back and read the mistakes of the attacker in the previous posts and think how a potential target would force those scenarios. If you remain calm and analytical you will buy yourself time. Time will be on your side in this fight. The longer he takes to shoot you down the more anxious he will get.

"OK, Sensei, nice words but how about some other examples? What else can I do?" OK, imagine spotting the bandit at your high 12 and he is diving on you. Maybe he is hoping for an engine shot or a head shot. What should you do? Well, the worse thing to do is to turn. The best thing to do is to raise your nose and meet him head on. Who knows, you might get a lucky shot, but that isn't the real reason. When doing this be sure to watch your airspeed. Don't let it get to stall speed. While you raising the nose angle a bit to one side or the other (left or right) just slightly. While still above stall speed and as he closes rudder hard over the opposite direction of your initial drift. Because of all the smash he has going, the enemy in most cases cannot follow the maneuver and he will begin to pull up. If he was going very fast he might actually dip below you.

Let's say your drifting to the right a hair (3-5 degrees) and hard ruddered to the left. What do you do then? Good question, remember back to wing-over maneuver? That is the one where you pull up a bit and roll with rudder in one direction so that you make a 180 degree turn without losing alt or energy. This is a perfect opportunity to do that maneuver. Your enemy will have either already begun to reclimb or if you are real lucky, he dipped low and is now reclimbing. You might even be in range to get a few shots on him. Another option is that after the hard roll you even out and spiral climb back around. What you have done is negated his speed advantage by meeting him head-on and also taking away his high percentage shot. You may have even forced him to overshoot and get your own shots off. The key is he lost a bit of E while you gained some and narrowed the gap. BTW, the drift one direction and hard over into another is often called the "flick and flee".

Another technique I have used to a bit of success is an aborted barrel roll. Let's say I screwed up and the bad guy is diving on my 6 for a good tail shot and I am too slow to split-s underneath or make any drastic maneuver. He comes barreling in waiting for me to make a break turn so he knows which way to high yo-yo. I start by jinking a bit to throw off his aim, just little bumps left and right/up and down, when he gets fairly close and I start taking hits I roll hard to the right but at the same time stomp hard on the left rudder. What will happen is that your plane will look like it is about to break right, but the opposite rudder will halt it right in mid-air. The diving bad guy will do one of two things... He will pull and high yo-yo in the direction he thinks you made a break turn. If he does you make a right low-g lag pursuit turn to get behind his 3-9 line and possibly get a shot. Another option is he just plows through the air right by you and you get a nice 6 shot. Option 3 is he plows into you and you both die. Option 4 is he really pounds your plane hard and just pulls up vertical to restock and reassess. Obviously Option 4 spells bad news for you. Option 3 is bad in that you die, but at least you take him out too. Remember, if the enemy held all the advantages and still died

then you win. He should not have died. The down side to this maneuver is that you will take damage. It may be too much damage to survive but if you do survive you will most likely begin to hold the upper hand.

To summarize, the key things to remember in a negative energy merge are as follows: 1) Stay underneath the nme using low G turns 2) climb when you can but don't over do it 3) relax and THINK 4) keep the bad guy in front if not on top. Force the head ons. 5) Don't pull a Top Gun Maverick maneuver. Most of my diving kills are on people who go straight to vertical in front of me. You will get ripped to shreds. 6) Remember, you are trying to get CO-E not kill the enemy! Once you get CO-E then use those techniques to get the E advantage. Only go for the kill when you have the E advantage. I cannot emphasize point 6 enough. Many people have anecdotes about a great last desperate head shot that wins the fight, but in 99.9% of the engagements that doesn't work. Don't count on it.

Look to work yourself into an advantage before trying to make the kill.