

Warbirds Online Academy

Wingman Course Manual

Preface

The purpose of this manual is as an accompaniment to the Wingman Course taught by Warbirds Trainers in the Warbirds training arena. It is meant as a review of topics to be covered and is in no way a complete treatment of any particular maneuver or tactic. It is imperative that the serious student of virtual aerial combat study all available reference material regarding the art of aerial warfare in order to gain a more complete understanding of the complexities and challenges particular to combat in the air and the idiosyncrasies of simulated combat in the virtual environment.

The student desiring to participate in the Wingman Course should review the material to be covered in the lesson prior to attending the lesson. After the lesson the student should accomplish all assigned practice drills and again review the material covered. This will help solidify the concepts for later application.

The goal of the course is to prepare students to be more competitive in the online arenas but, as always, the focus remains on fun. Warbirds is designed to be an entertaining, rewarding experience and that will be the focus throughout training in this course.

Good luck and Good Hunting!

Acknowledgements

During compilation of this manual the author realized the extent that credit must be given to the appropriate sources. Of primary importance is an icon of the virtual aerial combat community, Robert L. Shaw. Without his work, **Fighter Combat: Tactics and Maneuvering**, this manual would not exist. The influence of this work upon this manual cannot be overemphasized. All of the tactical concepts presented here are directly drawn from Mr. Shaw's work. It is highly recommended that this work be included in any student's personal aviation library. Included in the Basic Fighter Maneuver chapter you will find several references directing the reader to Mr. Shaw's work for further study.

Also the author would like to thank all of the Warbirds trainers, past and present. All have contributed in some fashion. The following players have been especially critical to the development of this manual.

=dobs= =tech= daddy= crch= =flet= =gryf= =varg= =fear= =bigD= =jaws= sco-be and weiser

A special note of gratitude to the Texas Tornados. They gave me the opportunity to develop by trial and error much of the content of this course.

All of the good stuff in here is because of the folks I mentioned above. I have liberally used their words throughout this manual.

Any errors, omissions, or other nonsense is completely my fault.

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Chapter 1 - Formation Flying

The Air Combat Learning Laboratory

Tactical Formations

Tactical formations are employed in order to bring multiple aircraft to bear upon the enemy together. Formations are the basis of all wingman and larger engagement tactics. The easiest and most effective formation to employ in the virtual aerial combat arena is the echelon and finger four formations. This is due to the lack of peripheral vision in the online simulation environment. Line abreast formations are historically more effective but more difficult to employ in the virtual world. As a result the echelon formations shown will be the primary formation for most online flying. Combat spread or line abreast formations may be used when entering a known hostile zone or upon contact with the enemy.

As we intend to employ the tactical doctrines of Double Attack, Loose Deuce and Fluid Four, our formations will be of a spread variety. Horizontal separation of aircraft should be approximately 1 to 2 turn radii.

Formation Organization

Military units are organized using specific terminology. The precise terminology will depend on the country and branch of service.

For example in the United States Army the basic unit is the soldier.

Soldiers are grouped into **Squads**

Squads are grouped into **Platoons**

Platoons are grouped into **Companies**

Companies are grouped into **Battalions**

And so on up to the Army level.

The Air Forces of the world do much the same thing with pilots and aircraft. For simplicity sake we will use a system based loosely on the USAF for training purposes.

The basic unit is one aircraft (and pilot)

2 or more aircraft will be grouped into an **Element** under an Element Leader

2 or more elements comprise a **Flight** under a Flight Leader

2 or more flights comprise a **Squadron** under a Squadron Commander

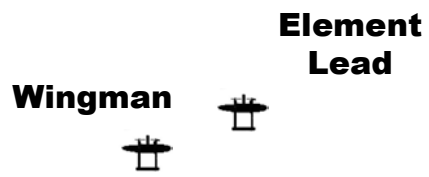
2 or more squadrons comprise a **Group** under a Group Commander

Warbirds rarely exceeds Group level operations

Below are examples of the Element Echelon formation

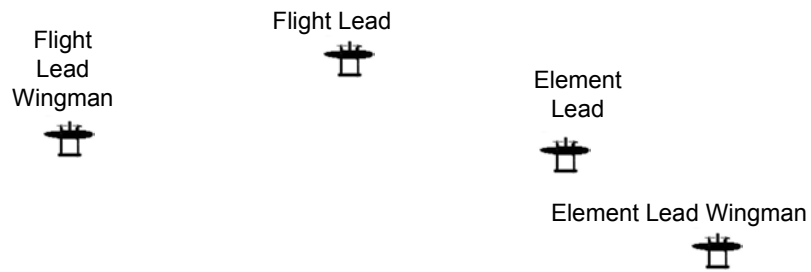


Right Echelon Formation top view (300 Yard separation)



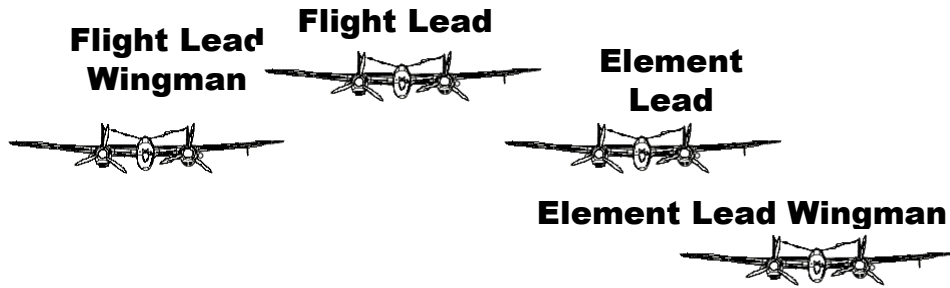
Left Echelon Formation top view (300 Yard separation)

The element formation is used to build the flight formation. Below is an example of the flight in finger four.



Finger Four Formation top view (300 Yard separation)

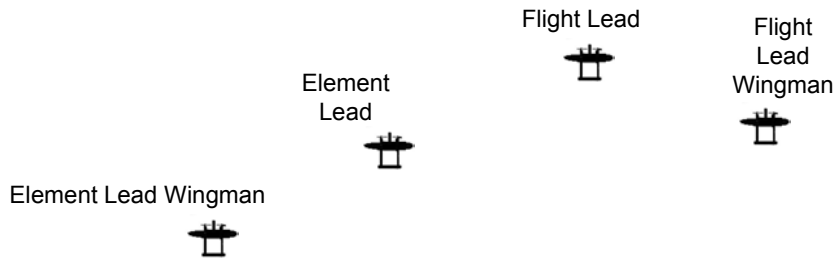
Here is a front view to illustrate vertical separation. This vertical separation is just enough for ease of maintaining station in the formation.



Finger Four Formation Front view

This view shows the proper vertical stacking.
Horizontal separation is reduced for clarity.

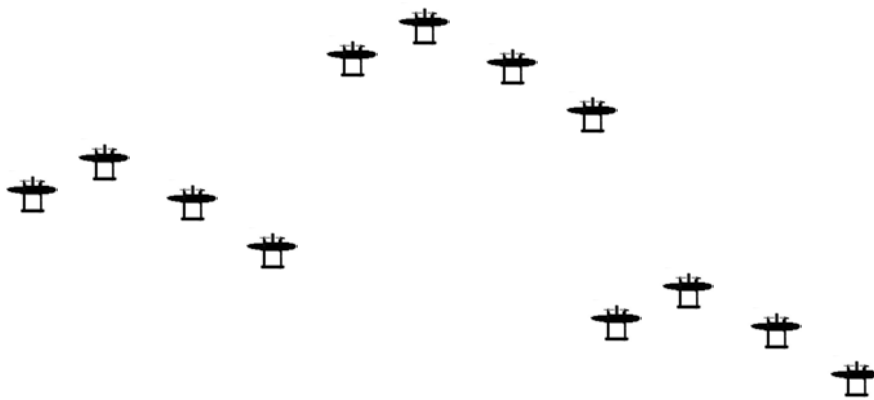
Finger four formation (named because of the resemblance of aircraft positions to the tips of the fingers) may be either left or right-hand finger four. The flight lead is always the middle finger, his wingman is index, the element lead is always the ring finger, his wingman is the pinkie.



Left Hand

Finger Four Formation

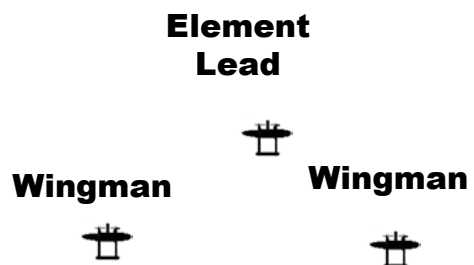
Top view (300 Yard separation)



A Squadron of three Flights heading for battle

. Above the Flights are in Finger Four and the Squadron is in Vee or Vic formation

While the finger four will be the primary formation, some situations may call for variations from this formation. Here are a few examples.



Vee or Vic Formation

**Element
Lead**



Wingman



Trail Formation (500 Yard separation)

It is highly desirable for the Element to be in combat spread in hostile areas. Combat spread provides the best defensive lookout for both Lead and Wingman with each aircraft blind spot being covered by the other pilot. The disadvantage of combat spread lies in the difficulty in maintaining combat spread in the virtual environment.

**Element
Lead**



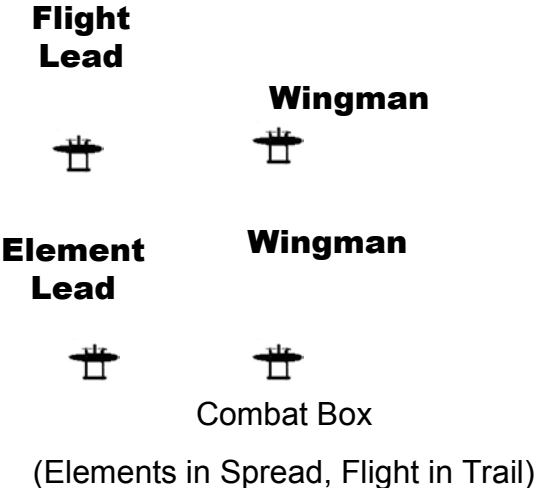
Wingman



Right Combat Spread (500 Yard separation)

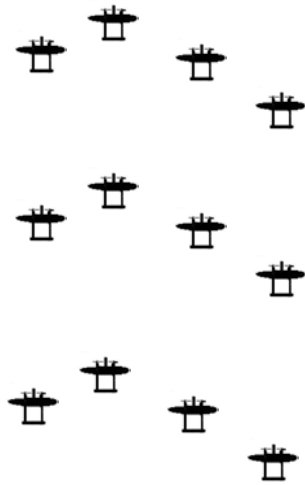
Formation types may be mixed in a large formation.

The element might fly in combat spread with the flight flying in trail. This is a combat box.



Add a combat box on either side and you would have elements in Combat Spread, Flights in Trail and Squadron in Line Abreast

Some more examples of mixing formations.



Flights in Finger Four
Squadron in Trail

The type of formation used will depend on many factors. These factors include number of aircraft, mission, planned tactics, expected enemy, experience of pilots, and other conditions.

Flight and Element Formation

Element Formation

The Element is the basic formation unit. It consists of an Element Leader and a Wingman. This 2-ship formation may also be called a wing pair, Element or some other name.

Duties in Element Formation

The element lead makes the basic tactical decisions for his element and coordinates with his flight lead. The Element Lead must maintain formation station on the Flight Lead and be prepared to carry out the tactical orders of the Flight lead. He is also responsible for defensive lookout for his wingman.

The wingman in an element is responsible for defensive lookout and with carrying out the tactical orders of the element lead. The wingman must maintain proper formation station on the element lead and be prepared to execute element maneuvers when called upon.

Flight Formation

The Flight is made up of 2 or more Elements. One element lead will be designated as the Flight Lead. The preferred tactical unit is a four aircraft flight (2 elements). Three or more elements in a Flight may be desirable for certain missions or situations.

Duties in Flight

The Flight Lead retains all of the duties of an Element Lead. In addition, he is responsible for making the flight tactical decisions and for carrying out tactical orders from Flight, Group or Squadron Leads as appropriate.

The wingman in a flight lead element retains all of the responsibilities of an element wingman. Because of the high workload imposed on Flight Leads, his wingman must be extra vigilant and provide the Flight Lead with timely information.

Large Formations

There are infinite possible combinations of formation possibilities with varying degrees of command structure complexity. Fighter units should strive to keep structure flexible and loose. The ideal structure has each pilot responsible for a maximum of two command levels at any time.

For example, an element wingman has only one command level, his Lead.

The Element Lead is responsible for his wingman and responsible to his flight lead, two command levels.

Task loading in the combat environment is a primary concern and must be minimized at all times. When engaged with the enemy the ability of an individual pilot to coordinate defensive lookout responsibility, engage in tactical maneuver and keep sight of the enemy and the wingman are almost overwhelming endeavors. Any additional responsibilities would almost immediately cause task overload and result in combat losses.

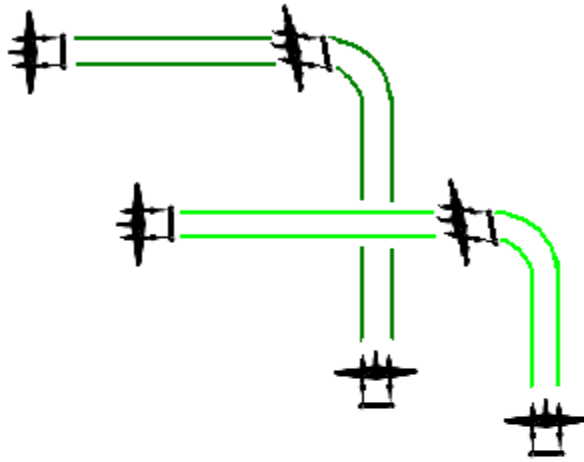
Large formations are necessary to bring force to bear upon the enemy but once engaged the individual elements must have the ability to fight as a unit. Coordination with other elements is desirable but not at the expense of element integrity. Training in large unit engagements can improve Element and Flight coordination.

For the purposes of training any formation of 2 or more flights will be considered a squadron formation with a squadron leader flying as Flight Lead in one flight.

Tactical Formation Turns

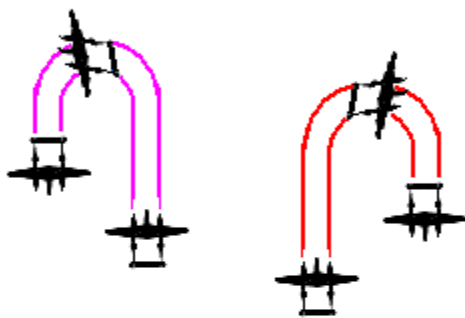
Formation turns are maneuvers designed to maintain energy and provide adequate rear quarter visibility during the turn. We will employ three types of formation turns in combat.

The Tactical Turn or TAC Ninety (Left or Right). This turn is executed in stages. The aircraft on the outside of the turn begins the turn when it is called. Aircraft delay 1 to 2 seconds and then commences the turn in order from outside of turn to inside of turn. Two TAC Ninety turns must be called to effect a course reversal.



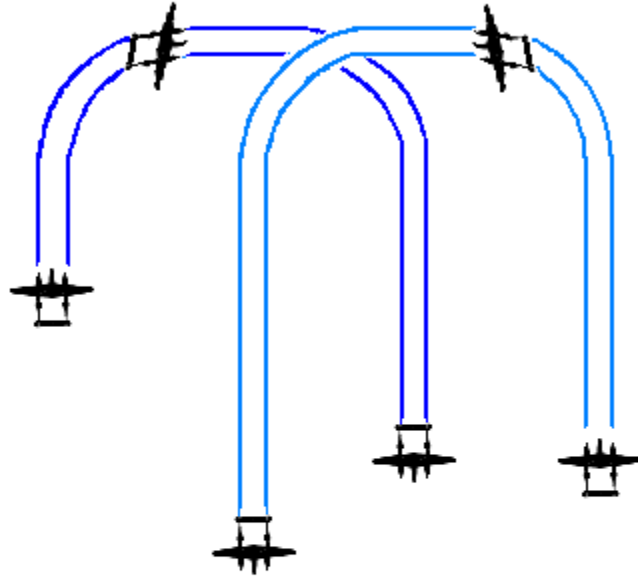
Tactical Turn Left (Tac 90 Left)
Formation starts in right echelon and finishes in left echelon
Two Tactical Turns result in 180 degree course reversal

Split Turns are used to set up a bracket maneuver on an enemy spotted in the rear quarter. A split may be horizontal or vertical or oblique but wing pairs must practice the communications necessary for employment of these turns. The same applies to the cross turn.



Split Turn-Used to increase Separation. Normally used to setup up a bracket. Split Turns can be done vertically, horizontally or in the oblique.

Cross Turn Illustration. Again these may be horizontal, vertical or oblique.



Cross Turn is used to decrease separation

Formation Joins or Rendezvous

We have covered what formations look like and some basic formation maneuvers. What we haven't done is discuss how we get into formation and how we stay there.

There are a few different methods for organizing a formation after takeoff.

The unit should line up on the runway in element pairs. Each element lead should call the takeoff roll in order. This allows the elements to begin the flight in formation and basically cuts the number of rendezvous in half. It is also beneficial to have the elements paired up if enemy attack may be possible.

Once all elements have successfully gotten airborne the unit can begin to join up.

Elements comprising a flight should join up first. After the flights are formed the squadron can assemble in its final formation. A typical squadron formation should be complete 2 minutes after the last element takeoff.

Rendezvous Methods

There are three methods of rendezvous normally used. Running, Running Turn, and Vertical Rendezvous.

Running Rendezvous

This method is a simple straight-line speed differential overtake. The Lead must set a low enough power setting to allow prompt overtake. This power setting should be announced.

Running Turn Rendezvous

This method employs Lead Pursuit techniques to achieve rendezvous. The Lead maintains a constant turn and the overtake is accomplished by using lead pursuit to cut across the Lead pilot turn circle. The rendezvous may be accomplished at high power settings if necessary. However, rendezvous will be expedited if the Lead pilot flies at a Running Rendezvous power setting.

Vertical Rendezvous

This method is accomplished by using an altitude separation for a vertical lead turn formation join. The joining pilots orbit at altitude and the lead pilot flies to the orbit point at a lower altitude. This rendezvous is especially useful after combat engagements.

Other Methods

There are many other methods and situations to accomplish formation joins and rendezvous. All employ the concepts of the above three as well as the Basic Fighter Maneuver concepts of lead turns and pursuit curves. All fighter pilots should continually practice the rendezvous and formation join techniques in as many different situations as possible. This practice builds the foundation of all fighter tactics and maneuver as well as building efficiency and confidence in formation skills.

Lead Turns

The concept of a lead turn is probably the single most misunderstood maneuver in virtual aerial combat. Almost every pilot in the online arena uses lead turns at the initial merge. Very few know how to employ lead turns after the merge.

Military aviation organizations use formation flying as a beginner's laboratory for aerial combat. In the virtual arena, we use formations but rarely as a training tool. A little practice drill called formation joins can work wonders for your BFM skills.

The goal of every virtual fighter ace is to arrive 'in the saddle', that magical place where you are locked up on the bandit's six and he can't shake you. The saddle is simply a close trail formation on the bandit.

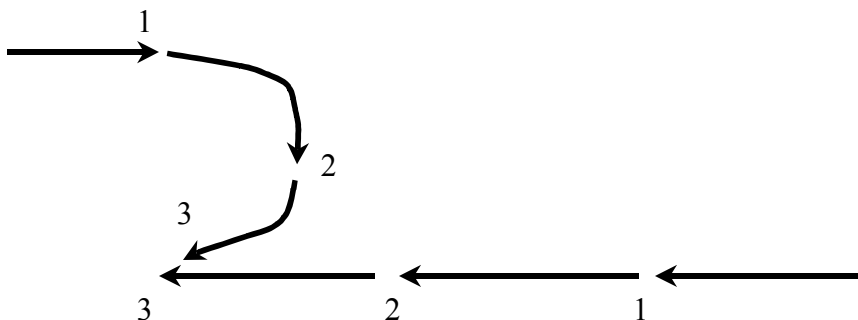
Arriving 'in the saddle' means predicting the bandit flight path and maneuvering your aircraft to arrive there when the bandit does. When you predict the bandit's flight path and act on your prediction you are lead turning. The further ahead you can predict the bandit's flight path the easier your job becomes.

Lead turns have nothing to do with Lead Pursuit.

You can lead turn in lag pursuit. In fact, most pre-merge lead turns are lag maneuvers.

The classic pre merge lead turn.

At time one the attacker begins the lead turn. At time 3 gun parameters are reached



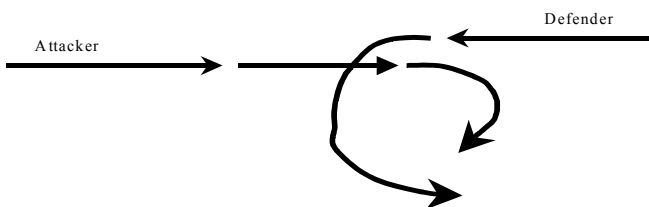
This is a lead turn executed with flight path separation of 2 times the turn radius of the attacker. Obviously, the defender is not looking, as he makes no reaction. At time one the attacker predicts the future position of the bandit and begins a maneuver to put his aircraft there. A close study of the above diagram reveals that the defender could use the attacker's lead turn against him. Lead turn timing is critical. A lead turn too early could mean giving the opponent positional advantage. A lead turn too late could mean an overshoot and loss of the offensive.

Nose to Nose and Nose to Tail Turns

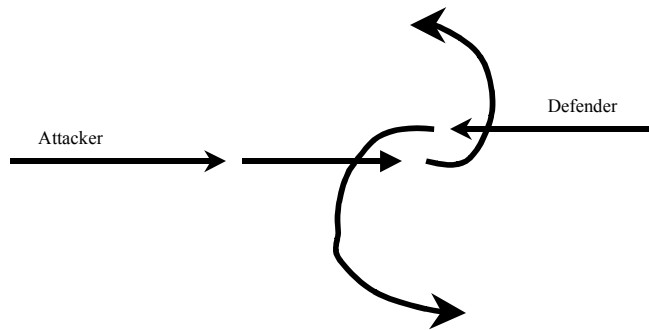
The names for these two turns are actually descriptions of the maneuver. They describe the relationship of the attacker to the defender in the turn. If you turn towards your opponents nose you are nose to nose. Turning towards his tail is nose to tail geometry.

Some illustrations.

Nose to Nose Geometry



Nose to Tail Geometry



Each type of geometry has its advantages and disadvantages. Nose to Nose geometry is advantageous to the fighter with smaller radius of turn. Conversely, nose to tail can benefit a fighter with greater turn radius but it will not generate an immediate offensive position. A fast fighter can use nose to tail geometry on a slower fighter to induce him to turn harder, bleeding his energy. If a fighter has a **Turn Rate** advantage nose to tail geometry can result in an offensive position.

See Fighter Combat: Tactics and Maneuvering Shaw, Robert L. pp. 77-82 for further discussion.

Chapter 3 - Welded Wing Tactical Doctrine

The basic wing pair doctrine

Origin of Welded Wing

Welded wing originated in the early days of combat flying. It was used as a tool to keep the neophyte aviator alive long enough to learn something. In Warbirds it serves much the same purpose. Welded wing is quite simple. The element leader plans and flies the fight and without communication the wingman follows the lead, attempting to stay in position to defend against anyone attacking the lead. This does not mean he must maintain perfect formation. What it means is the wingman must be in a position to immediately attack any bandit that approaches firing position on the element leader. This means the wingman must be in a position to shoot at the leader.

If one imagines the effective guns envelope as basically a cone extending rearward from the target aircraft out to the maximum range of the guns then one can easily see the proper positioning of the wingman during Welded Wing maneuver.

In Warbirds this cone extends out about 900 yards behind the lead and is about 30 degrees wide. This essentially puts the wingman in a loose trail formation on his lead during Welded Wing Maneuvering.

Advantages of Welded Wing

Welded wing is very easy to learn and is the perfect solution when flying with an inexperienced wingman. This is the primary advantage. Also, welded wing puts more guns on target so it is useful in bomber attack and ground attack missions.

Disadvantages of Welded Wing

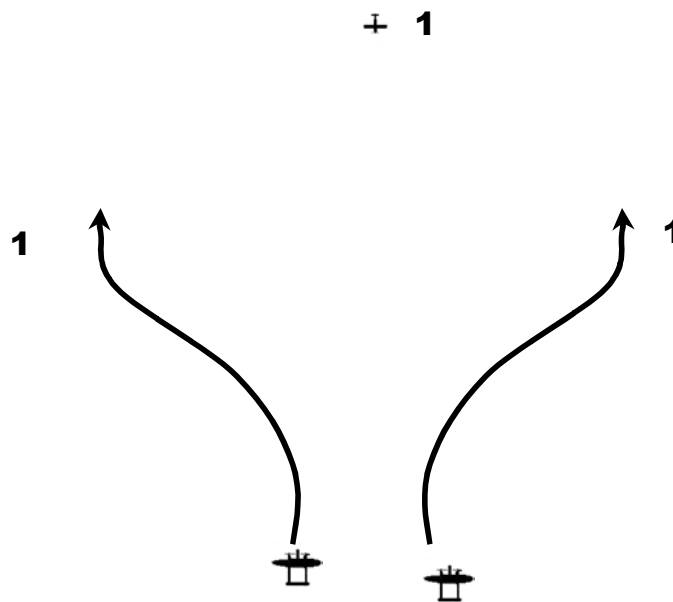
With the wingman essentially in trail formation the defensive lookout of the wing pair is severely reduced. The area of sky covered by the lookout is much smaller than in a spread formation. In addition to this the wingman has to concentrate on maintaining his position and this reduces the available time for defensive lookout. This makes welded wing a poor choice in high or unknown threat environments.

Chapter 4 - Tactical Doctrines and Maneuvers

Maneuvers

Offensive Split

The offensive split is a separation maneuver performed in order to split the formation into two parts, one on each side of the bandit formation. The diagram below illustrates the 2 v 1 offensive split.

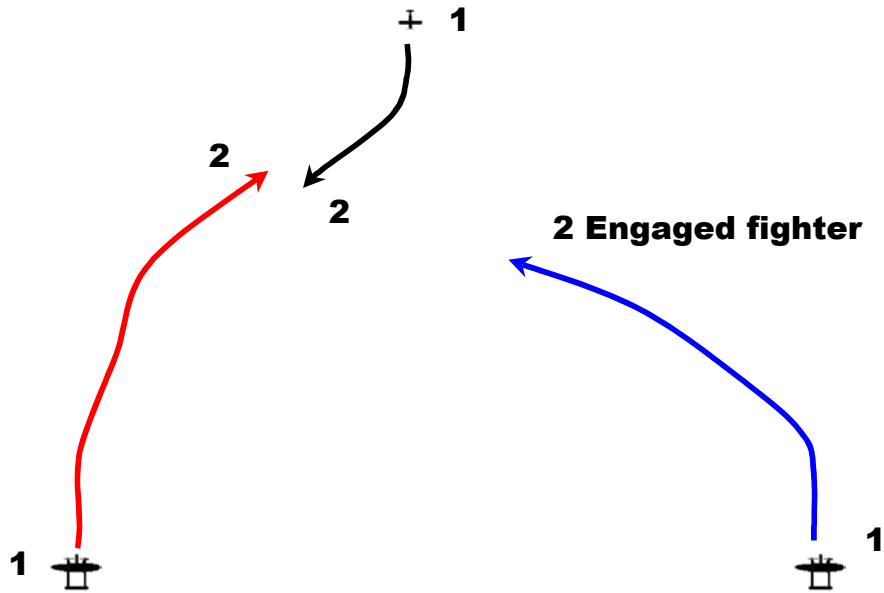


Offensive Split -Bogey Sighted

Bogey at d30 by time 1

The offensive split can be performed in the horizontal, vertical or oblique plane of maneuver. A wing pair operating alone should automatically split or bracket the opponent unless the lead calls for the pair to stick together.

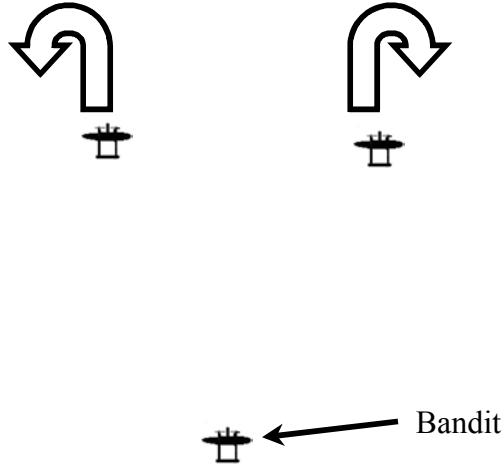
Units using voice communication should develop standard calls for this and all other tactical maneuvers to be performed as a unit. The objective of the offensive split is to achieve a bracket on the bandit by forcing him to react to the split by choosing to attack on side of the split. Below is an illustration of this.



The Bogey chooses!!!

This choice exposes the bandit to attack by the blue fighter.

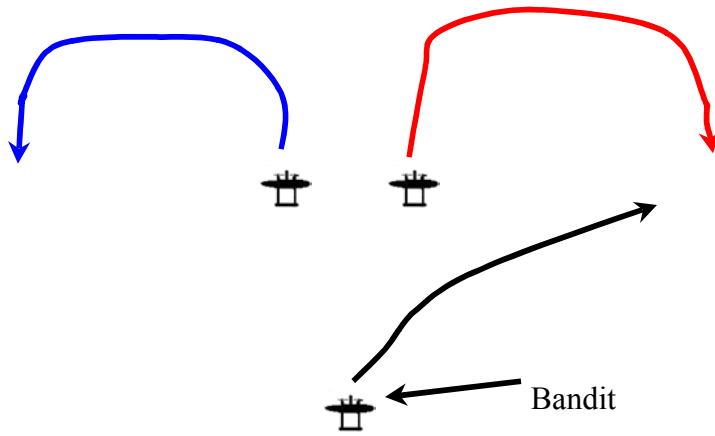
Defensive Split



Defensive Split

The defensive split is quite simply a split turn as discussed in the formation turn chapter. If the bandit is spotted at long range the split turn is quite effective in converting the situation into an offensive split/bracket situation. The defensive split is handy for making the bandit choose which side of the formation he will attack.

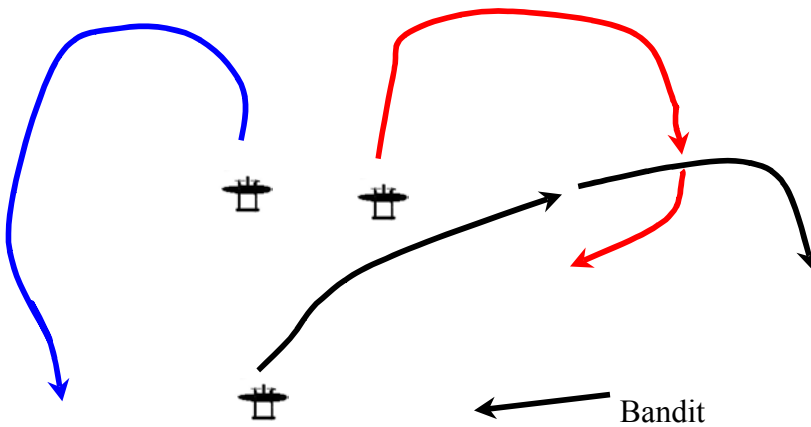
If the split turn is performed against a close in bandit it will result in the following situation.



Close in Defensive Split
Point 1

At this point the red fighter will likely need to avoid a guns pass and then continue his turn.

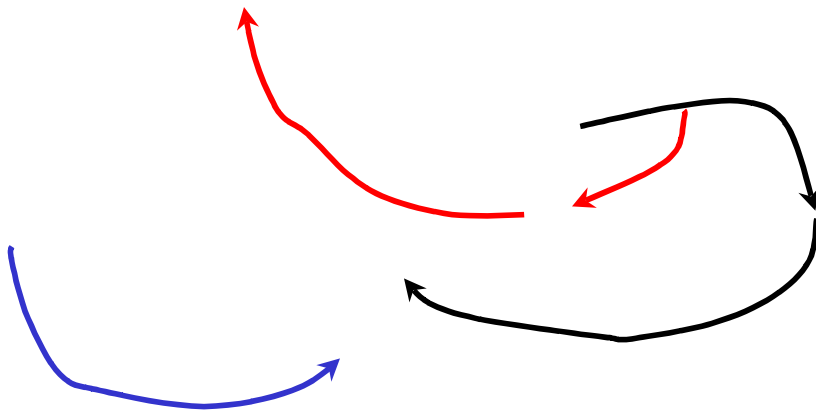
The following will develop.



Close in Defensive Split
Point 2

The red fighter has two choices, reverse the turn back towards the bandit or continue towards the blue fighter. A reversal would likely expose the red fighter to another guns pass unless he possesses a significant turn

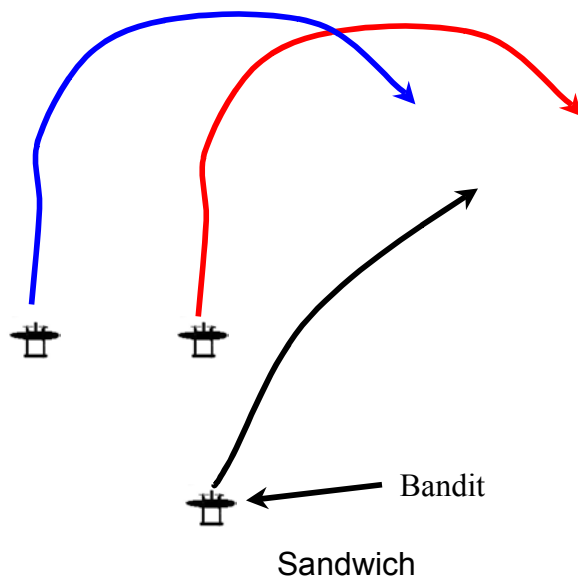
advantage over the bandit. Continuing towards the blue fighter would allow for the element to extend away from the bandit or rejoin for another defensive or offensive maneuver. If the attacker continues to press the red fighter we see this develop.



Close in Defensive Split
Point 3

The Sandwich

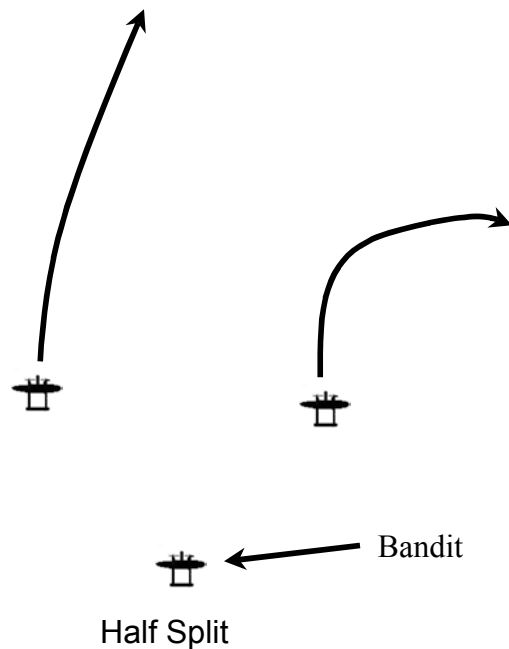
The sandwich is effective when a pair can identify the threatened friendly early. The pair then make a break turn in place to set a up the blue fighter into offensive position. The red or threatened friendly should break hard enough to avoid the attack. If possible the threatened fighter should disengage after the initial pass for a free fighter position. If the threatened fighter cannot disengage he should attempt to setup a drag or a high-speed egress towards friendlies.



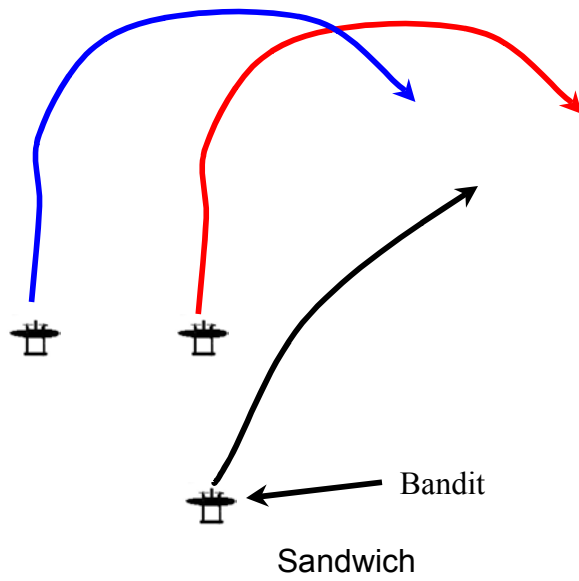
Half Split

The half split combines the sandwich and the split. It forces the bandit to choose a fighter to attack but the wing pair does not have to separate as widely.

In the half split one fighter executes a hard nose low turn away from his wingman at energy conserving G levels while his wingman extends basically straight. Both watch the attacking bandit to see whom he chooses to attack.

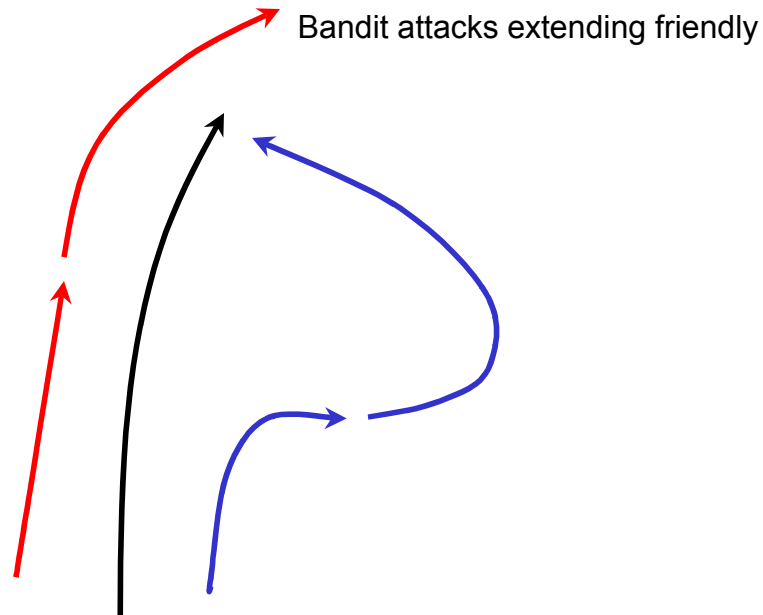


Once he chooses the wing pair can then maneuver to gain the offensive. If he chooses the turning fighter we see a situation very similar to the sandwich develop.



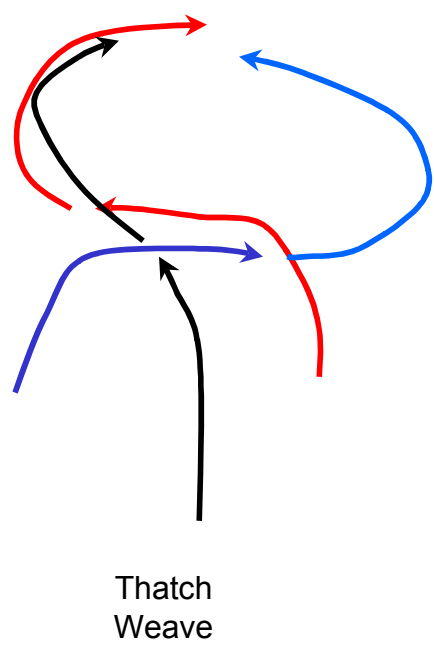
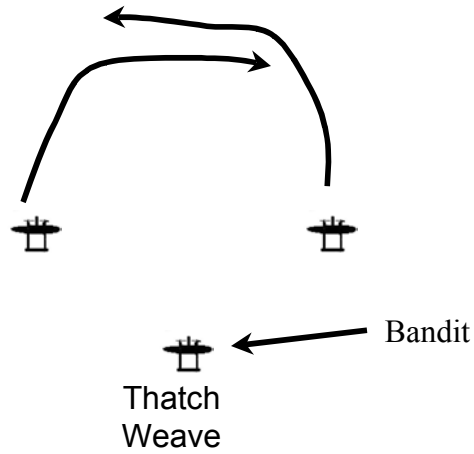
If he chooses the extending fighter the turning fighter then reverses the turn to engage the bandit from the side.

Half Split



Thatch Weave

John Thatch developed the Thatch weave for use against the lightly armored but superior turning Japanese fighters. It is essentially a series of nose to nose turns used in defense of a rear quarter attack. The element performs hard turn towards each other when attacked and then reverse those turns as soon as they pass. These turns are designed to give the free fighter a high angle snapshot on the lightly armored fighter attacking his wingman.



Element Tactics: Double Attack Doctrine

The doctrine of double attack can best be described as tag team wrestling in the sky. The idea of Double Attack is to put the enemy under continuous offensive pressure until the kill is achieved. The key to successful double attack is a smooth transition between attacking aircraft so that the bandit does not have time to recover lost energy or situational awareness. The following is an example of double attack applied to a specific tactical situation. Pilots should learn the theory behind a particular tactical doctrine instead of attempting to memorize particular maneuvers. This will allow the wing pair to effectively apply the doctrine in all tactical situations.

An Element of two aircraft employing the doctrine of double attack can be very effective when an advantage is secured early in the engagement. The doctrine of double attack is based upon the following criteria.

1. A Element of two aircraft operate in echelon with minimal trail or line abreast formation
2. Wing tip to wing tip separation is maintained between 1 to 2 turn Radii. In the P-38 this is about d2 to d9 depending upon model, speed, and altitude.
3. An Element lead is established for overall command but the wingman must be capable of recognizing the tactical situation and acting as lead. This is because during an engagement lead duties evolve to the engaged pilot.

Engagement tactics

When an enemy aircraft is spotted it is of primary importance that the flight lead be made aware of the enemy aircraft position prior to engaging.

If the enemy aircraft position and direction favors an attack by the wingman he will then commence the attack. At this point he assumes lead duties and the other pilot stays disengaged or free.

The engaged fighter will press his offensive advantage.

The free fighter will assume a position above the fight and will conserve/increase his energy state. The primary duty of the free fighter is to maintain defensive lookout. His secondary duty is to relieve the engaged fighter if necessary.

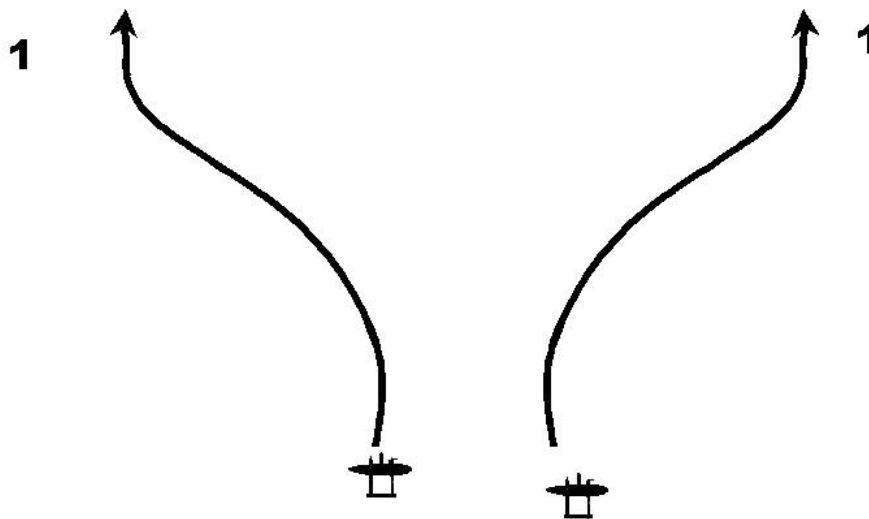
The engaged fighter will press his attack while maintaining the offensive or advantage. If the offensive advantage begins to dissipate due to an overshoot or energy loss the engaged fighter must disengage immediately, hopefully

simultaneously calling in the free fighter. At the moment of this disengagement the roles reverse. The free fighter becomes engaged fighter and the engaged fighter becomes the free fighter. It is imperative that the new free fighter regains his lost energy or position in anticipation of the next swap. These role reversals continue until a successful kill is achieved, advantage is lost or enemy help arrives. At the first signs of help arriving or other indications of disadvantage the Element should disengage and extend for reengagement or egress.

Double attack engaged fighter is not always the fighter closest to the enemy. The engaged fighter is the fighter with the greatest offensive advantage. This becomes clearer when we examine the “offensive split” or bracket.

An Element encounters a lone bogey and performs an offensive split. The bogey has three choices: He can extend through the split, turn to engage one of the two or attempt a course reversal prior to the merge. Until the bogey decides BOTH of the Element are engaged because the offensive potential is equal. If the bogey extends through or reverses without turning toward one of the attackers both remain equal offensively.

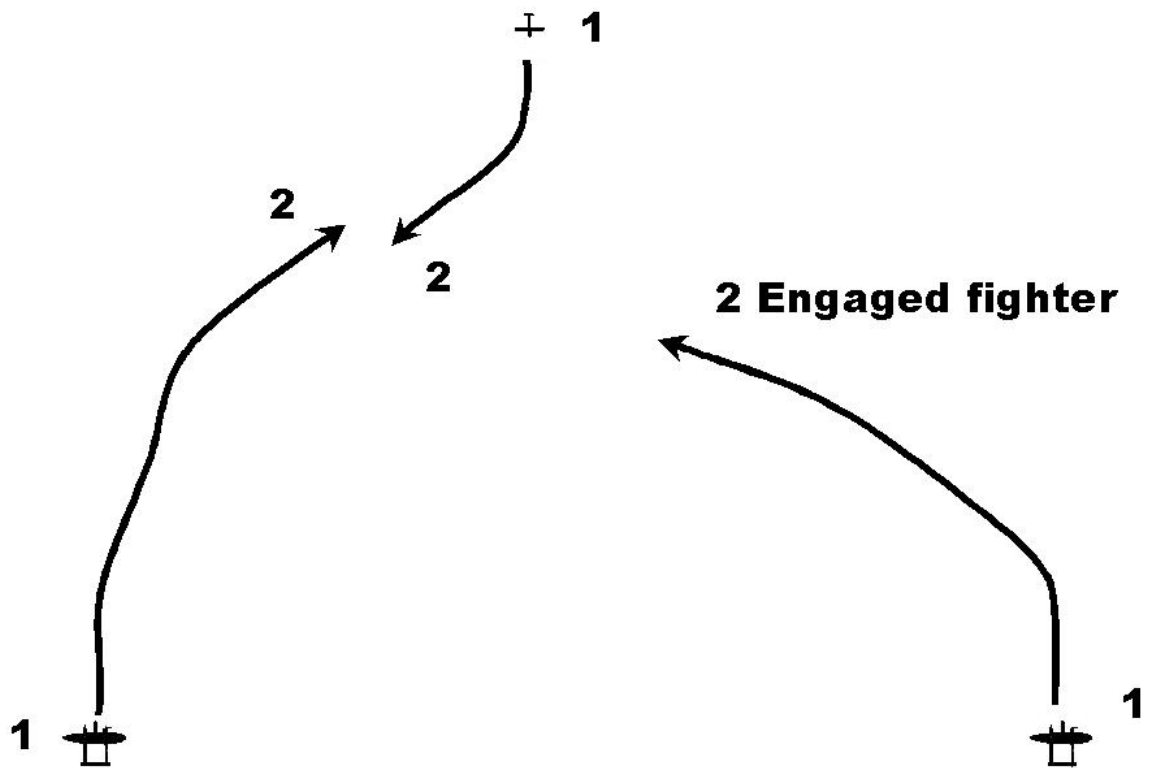
± 1



Offensive Split -Bogey Sighted

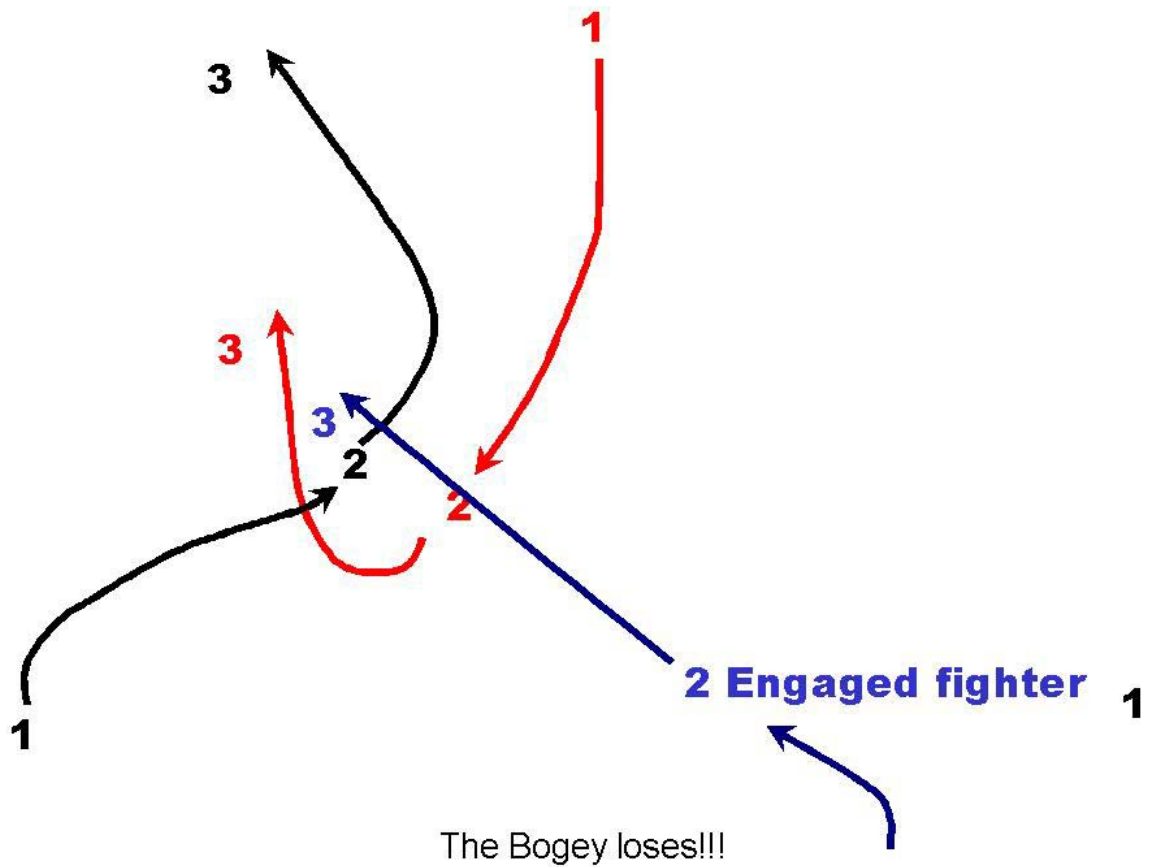
Bogey at d30 by time 1

When the bogey turns toward one of the two attackers the situation rapidly changes.



The Bogey chooses!!!

The fighter that the bogey is engaging must respond to the bogey and this reduces his offensive choices while the other fighter in the Element is given a better angles presentation on the bogey. This fighter becomes the engaged fighter and presses his attack. The other fighter either disengages to a free position or maintains defensive maneuvering, whichever is necessary or more efficient.



This defensive maneuvering is sometimes referred to as dragging and indeed the defensive fighter should attempt to maneuver so as to lure the bogey into easy guns range of the engaged fighter.

The offensive split or bracket is very effective in the Arena because most opponents do not expect coordinated units. All they see is an easy kill. The more you can look like an easy kill the more successful the bracket is. When the opponent falls for this bait I usually get a very good belly side tracking shot on the bogey in his first turn.

Loose Deuce Tactical Doctrine

Loose deuce is really a variation of the Double Attack doctrine. Similar to double attack in most ways, the major difference lies in who does the shooting in an offensive engagement.

In loose deuce the free fighter becomes the shooter and the engaged fighter, while supplying plenty of offensive pressure, should not press the attack unnecessarily.

The objective of the loose deuce is to setup the bandit for a blind side attack.

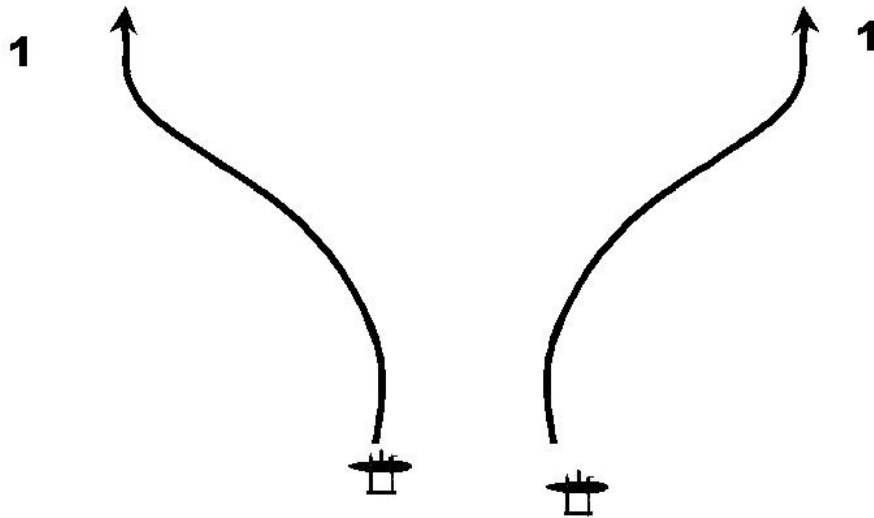
The best analogy I can come up with is a Cougar and an Eagle working together to kill a rabbit.

The cougar chases the rabbit around in a circle while the eagle climbs above the circle. Then the eagle swoops down on the rabbit while it is busy watching the cougar.

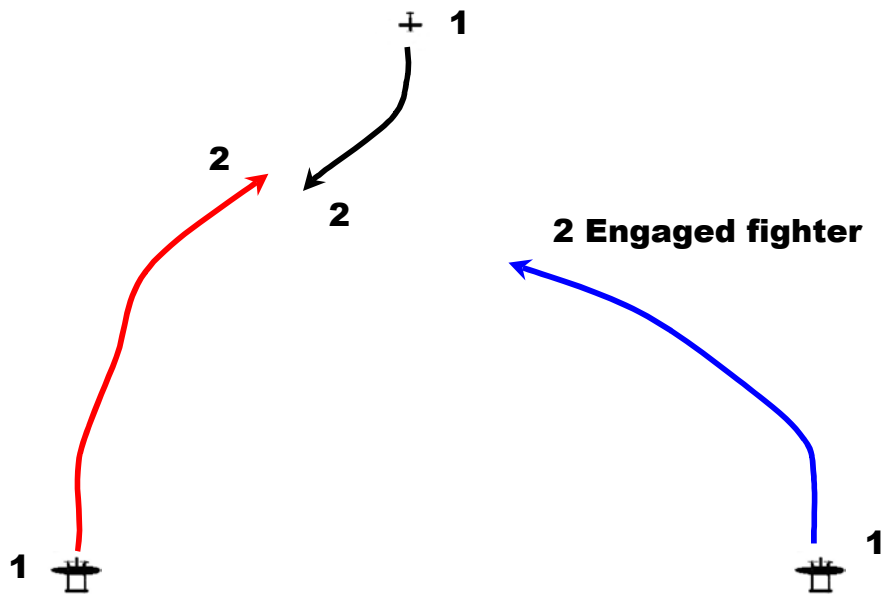
This is essentially how Loose Deuce works.

It all starts with the offensive split.

± 1



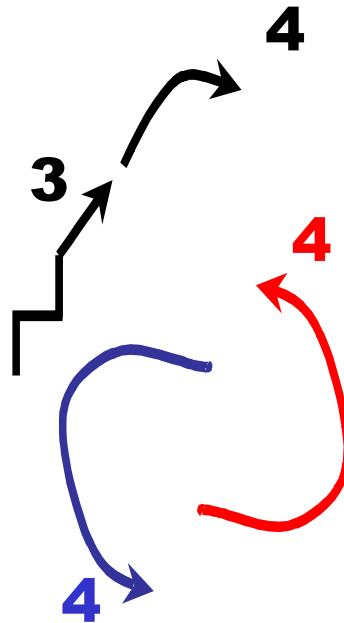
Offensive Split -Bogey Sighted
Bogey at d30 by time 1



The Bogey chooses!!!

At this point the blue fighter (the one on the right) becomes the cougar and the black becomes the eagle. In this case the bandit ignores the black fighter and turns to defeat the blue fighter attack. The blue fighter should keep the offensive pressure on the red bandit and try to keep the fight in the horizontal. The blue fighter can do this by keeping his nose slightly low as he turns hard into the bandit. The next diagram shows what the black fighter should do to set up for the kill.

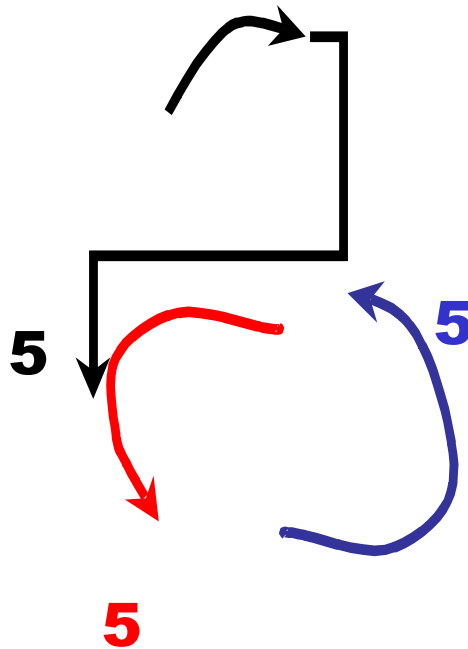
The black fighter uses a slight turn while in pure vertical to position



The black fighter positions above the fight for kill

The black fighter pitches vertical at the pass to position himself directly above the two lower aircraft. As he gets the nose above 60 degrees the black fighter must look down and back to initiate a drifting turn over the bandit side of the fight. Ideally the black fighter should reach the peak of his zoom climb as the red bandit completes $\frac{1}{2}$ of a circle. At this point the black fighter goes nose low to set up a high side attack. As the bandit keeps turning he will expose the belly of his aircraft to the black fighter who is now diving in. Since the black fighter is now on the bandit's belly side he will have a completely unobserved attack path. This should result in a kill.

The black fighter dives in from high belly side of bandit



The black fighter has kill shot at or before point 5

As soon as the blue fighter sees the black fighter reach an offensive position he should disengage from the fight and take the free fighter (eagle) role. The black fighter will become the engaged fighter if he doesn't achieve a quick kill. The cycle then repeats itself or the pair decide to disengage from the fight.

The great advantage of the Loose Deuce is the ability to kill quickly. If a Loose Deuce engagement proceeds much past the first high side attack it has a tendency to degenerate quickly into a tail chase. While the initial bandit may eventually die, his buddies will be coming fast.

It is probably best for the Loose Deuce pair to disengage at or before the second guns pass on the bandit.

Loose Deuce is a very effective method for a wing pair but it does require much training because the timing is critical. It is best employed when both pilots are well versed and experienced in its use.