Military Procedures

Introduction

This guide is meant for ATC and tries to give an overview over the most common topics in regard to military operations on Vatsim. Be advised that some of these topics may only be performed by pilots who are part of a Vatsim Special Operations (VSO) Organisations such as vNATO or vUSAF.

For reference see the the Virtual Airlines Partner Policy. To the author of this guide it seems as if Air to Air Refueling and Scramble for the purpose to intercept another aircraft may not be performed by pilots who are not part of a VSO Organisation. All other procedures mentioned in this article can in theory be performed by any pilot on the network, however, it is advised to first check with ATC before attempting any of the more special operations.

Lastly, I - the author of this article - want to make clear that the available information for this topic is limited. Most of the explanations and examples in this guide are based on trustworthy but incomplete information. Thus, the trustworthy bits of information are combined with good guesses to try to make sense of it and to try to paint a complete picture. I hope that in the future, the military knowledge of this guide can be the basis for further corrections and expansion of knowledge.

Tower

In general, Military Airfields work a little different to the airports that you might be familiar with. They have a control tower and a radar station that you might call approach. However, the radar airspace is not nearly as high as the approach airspace you are familiar with. But first we will look at the Tower position.

Just like a DFS TWR, the military TWR is in control of a CTR and all ground movements. However, it cannot issue IFR clearances. Instead IFR clearances are requested at the responsible DFS station via telephone. First, the DFS station transmits the clearance to the military TWR that reads it back. Then the military TWR transmits the clearance to the pilot, who reads it back to the TWR. In real life the military TWR first calls the military Radar who then calls the DFS station, but I think we can skip this step ;)

IFR clearances are similar to those you are used to. They simply contain the point that the aircraft is cleared to, "first fix" (A fix somewhere on the flight plan), the SID/OID, a squawk and instructions whom to contact when airborne. They may contain a flight level but that is often left blank for convenience. Military Aircraft usually aren't instructed to follow a SID but an OID (operational instrument departure) which is similar to a SID. They are usually named with the last two letters of the ICAO code of the airport and a number (e.g. NL19, pronounced November-Lima-one-niner). You can find these on Navigraph and in the AIP. However, if the SIDs have names or if the aircraft is flying according to a civil aviation flight plan (fixes and airways) then you should assign a SID if available (like ETOU).

Furthermore, military airfields rarely have multiple taxiways and if they do, they have standardized taxi routes. Therefore, you do not need to name taxiways when giving the taxi clearance. You also have to ask the DFS radar station for a departure release before issuing a takeoff clearance due to the low radar airspace.

Another specialty of Military TWRs is that the wind is given during line up and take off. This is because especially formation flights have a lower crosswind limits for formation takeoffs and the pilots need to know before line up if they can depart as a formation or if they need to depart individually.

As opposed to normal TWRs, military TWRs do not offer an ATIS. Instead, the weather information is given as a color code. Additionally, the QNH and the active runway have to be communicated to the pilot. The color codes and the respective weather are listed below. In case the visibility and cloud ceiling color do not match, the color corresponding to the worst weather of the two is published.

- **Blu+:** cloud ceiling (more than half of the sky is covered) below 20000ft. (not BKN or OVC below 20000ft)
- **Blu:** visibility 8000m, cloud ceiling at least 2500ft

- **WHT:** visibility 5000m, cloud ceiling at least 1500ft
- **GRN:** visibility 3700m, cloud ceiling at least 700ft
- **YLO1:** visibility 1600m, cloud ceiling at least 500ft
- **YLO2:** visibility 1600m, cloud ceiling at least 1600ft
- **AMB:** visibility 800m, cloud ceiling at least 800ft
- **Red:** visibility less than 800m, clould ceiling less than 200ft or VV//
- **Black:** Runway closed for other reason than weather

White is still considered sufficient for VMC operations while Green requires IFR procedures.

Below you find an example IFR flight from initial call to handoff to the military radar. We assume the pilot has filed a flight plan which he should do.

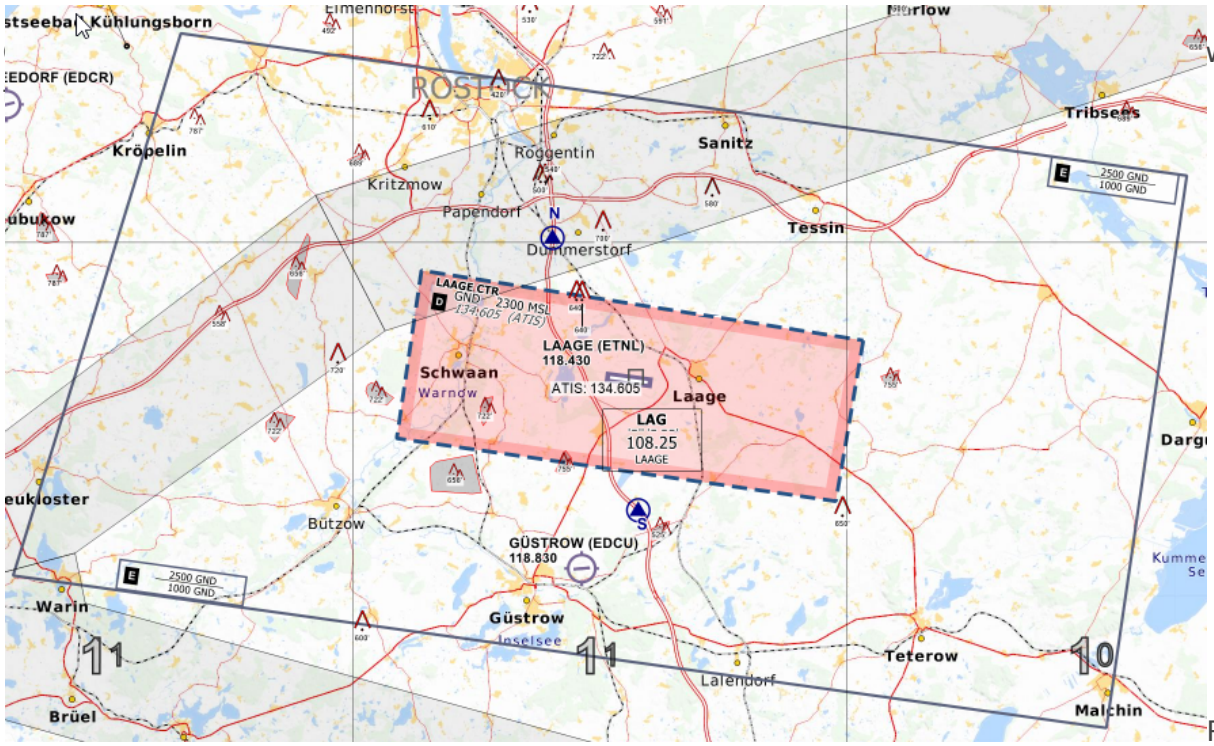
Station	IFR from startup to departure
GAF123	ETNT_TWR, GAF123, Moin
ETNT_TWR	GAF123, ETNT_TWR, Moin
GAF123	GAF123, request taxi
ETNT_TWR	GAF123, taxi to holding point runway 26, QNH 1013
GAF123	GAF123, taxi to holding point runway 26, QNH 1013
During Taxi ETNT_TWR calls EDWW_B_CTR	
EDWW_B_CTR	Moin
ETNT_TWR	Moin, ETNT_TWR, request clearance for GAF123
EDWW_B_CTR	GAF123 is cleared to Schleswig via EMPIT, squawk 2116
ETNT_TWR	GAF123 is cleared to Schleswig via EMPIT, squawk 2116
EDWW_B_CTR	correct
Back on frequency	
ETNT_TWR	GAF123 report ready to copy clearance
GAF123	GAF123, ready
ETNT_TWR	GAF123, cleared to Schleswig via NT126 left turn EMPIT, squawk 2116, when airborn contact ETNT_APP on xxx.xxx

Station	IFR from startup to departure
GAF123	GAF123, cleared to Schleswig via NT126 left turn EMPIT, squawk 2116, when airborn contact ETNT_APP on xxx.xxx
ETNT_TWR	GAF123, readback correct
Pilot reaches runway and performs pre-departure checks. After pre-departure checks	
GAF123	GAF123, ready
ETNT_TWR	GAF123, line up runway 26, wind 25005kts
GAF123	GAF123, line up runway 26
Meanwhile on the phone...	
EDWW_B_CTR	Moin
ETNT_TWR	Moin, request departure release for GAF123
EDWW_B_CTR	GAF123 released to climb FL70
ETNT_TWR	GAF123 released to climb FL70
Back on frequency	
ETNT_TWR	GAF123, climb FL70, wind 25005kts, runway 26 cleared for takeoff
GAF123	GAF123 climb FL70, wind 25005kts, runway 26 cleared for takeoff
After take off	
ETNT_TWR	GAF123 contact Wittmund Radar on 123.125
GAF123	GAF123 contact Wittmund Radar on 123.125

After this the Radar will identify the aircraft before handing the aircraft over to the responsible DFS station.

Military Radar

Airspace



will describe Rostrock/Lage

Airport - © openflightmaps.org

We will start with Rostock Laage. As you can see, the airport has a D-CTR just like all other airports in Germany. Additionally, the airport has a lowered airspace E around the CTR. Almost all military airports have that. The horizontal boundary of the area of responsibility of the Radar coincides with the lowered E airspace. The horizontal boundary is 5500ft. Below 5500 ft and inside that lowered E, the radar controller is responsible for the IFR traffic. As always in airspace E, VFR may enter the airspace without contacting ATC.

Two more examples of this are Diepholz and Wittmund. Just like in the previous example, the vertical limit of the area of responsibility of the military Radar is 5500ft. The horizontal limit coincides with the lowered airspace E. In case of Wittmundhafen, the area of responsibility is the inner rectangle of the TMZ. With this knowledge you can estimate how big the area of responsibility of any military radar is. The upper limit is 5500ft in most cases. The actual area of responsibility can be found in the military AIP (MILAIP, AD2, Minimum vectoring altitude/Area of responsibility chart for each airport).

General Controlling

In general the military Radar has the same responsibility as a typical APP controller. However, you have to remember that you are working with high performance military aircraft and possibly VFR aircraft that call for FIS. In this case you should not rely on visual separation alone as the closing speeds of a 300kt military jet and a 80kt VFR aircraft is too great to simply ignore. In this case working with vertical separation is the easiest solution.

In general military Radars seldom work with procedures. They mostly use headings and altitudes. Speeds are also avoided. VFR and IFR departures are possible. If the pilot departs IFR, he will be handed over to the responsible DFS controller fairly early due to the low airspace boundary. If the pilot departs VFR, he has to follow the VFR departure route which can be found in the Military AIP (VAD). Every deviation from the departure route has to be requested by the pilot and approved by ATC ("request to leave CTR on top").

If the aircraft is arriving IFR, it will be handed over from Center descending FL70 and as early as possible. The aircraft should be released for descent by Center before handoff to allow the Radar controller to control the aircraft. The pilot may decide if he prefers to land VFR or IFR. VFR the arrival is done on TWR frequency as published in the VAD charts (overhead approach maneuver as described below). Sequencing is then done using traffic infos and by telling the pilot which number he is in the sequence.

Station	Example Flight with IFR Cancellation on entry
GAF123	ETNL_APP, GAF123, 5000ft
ETNL_APP	GAF123, ETNT_APP identified, weather code BLU, runway 27, QNH1013
GAF123	GAF123 blue, runway 27, QNH1013 cancelling IFR
ETNL_APP	GAF123, IFR cancelled at 45z, proceed to Entry South 27
GAF123	GAF123, IFR cancelled at 45z, proceed to Entry South 27
ETNL_APP	GAF123, contact ETNT_TWR 118.425
GAF123	GAF123, contact ETNT_TWR 118.425
On TWR frequency	
GAF123	ETNL_TWR, GAF123, proceeding to entry south

ETNL_TWR	GAF123, ETNL_TWR, enter CTR via Entry South 27
GAF123	GAF123, enter CTR via Entry South 27
Over Entry South	
GAF123	GAF123, Entry South 27, 1700ft
ETNL_TWR	GAF123, ETNT_TWR Roger, report initial, number 2 following EUFI on downwind 27
GAF123	GAF123, wilco

If VFR arrivals aren't possible then the military jet will be vectored to procedure and it will fly a PAR, ILS, TACAN, NDB or RNAV approach but without the procedures as described below.

Lastly, we will discuss IFR pickups. IFR pickups are mainly used for military aircraft that enter the area of responsibility of the Radar controller with the intention to land IFR. Departing traffic to leave will already receive the clearance on ground. IFR pickups for military aircraft are much simpler than what you usually do for civil aviation. You just have to make sure that the jet is above the MVA, that it has been assigned a HDG and an altitude (or you have assign either or both during the IFR pickup) and then you say "IFR starts now" and that's it. You should also include the clearance limit (e.g. "cleared to Schleswig") but that is often left out in real life. If you give a IFR pickup for an aircraft that is leaving your sector, you need to coordinate an actual IFR clearance with the DFS station. However, if necessary you can start IFR immediately (mind the MVA) and coordinate the clearance with the DFS station later.

Instrument Approaches/Procedures

In general military airfields tend to have a mix of ILS, NDM (DME), TACAN (DME) and RNAV approaches. However, most do not have an ILS. Instead the Precision Approach Radar (PAR) is used as a precision approach. However, that is not an instrument approach and thus will be explained in a later chapter.

As mentioned before, instrument approaches are mainly used without the procedure. Most military procedures include a DME Arc and then the familiar final approach. The waypoints on the procedure usually don't have a name so if you want to clear someone to fly the approach via the procedure, it's best to use the terms "Initial Approach Fix" (e.g. "out of IAF cleared TACAN rwy 27") or in general just explain to the pilot what you want him to do (e.g. "Join 12 DME Arc of TACAN rwy 27, cleared TACAN approach runway 27"). That is not quite the way they do it in real life but it will probably work well enough on Vatsim.

In general though it is enough to vector the aircraft to the final approach track and clear them for the approach. Remember that these are non precision approaches so the intercept must be done

before the FAF and on the published altitude. You should also make sure that the aircraft has 2NM of straight and level flight before initiating the descent.

Surveillance Radar Approach (SRA)

In this approach the pilot is provided with instructions and information on the aircraft's location relative to the extended centerline and distance from touchdown. During this approach there should be only one aircraft on frequency. If you ever need to give an SRA during operations with multiple approach controllers, you can let the director handle the SRA while the arrival controller handles all other traffic as usual.

In general the procedure for the controller is:

- The pilot needs to be told when the SRA terminates before beginning the descend and the OCA ("This will be a SRA approach, runway 25 terminating at the missed approach point, OCA 840ft, check your minima")
- The final turn onto the runway heading should not be more than 30° and there should be sufficient time before the start of the descent
- The pilot needs to be warned prior to descent ("11NM from T/D, 1NM prior to descend")
- The pilot does not read back the altitudes. He only confirms with his callsign.
- The pilot needs to be told when to initiate the descent ("10NM from T/D, commence final descent now")
- The pilot needs to be informed about the altitude each mile ("7NM from T/D, altitude should be 2500 feet")
- The pilot needs to receive heading adjustments when necessary or otherwise be told that the heading looks good ("left heading 245" or "heading is good"). Heading adjustmens by 1 degree should be avoided.
- At 4NM the pilot needs to be reminded to check gear down ("4NM from T/D, altitude should be 1600ft, remember OCA 840ft, check gear down locked")
- From 4NM to T/D transmissions should not be interrupted by more than 5 seconds.
- The pilot needs to be reminded one mile before approaching OCA ("2NM from T/D, altitude should be 1000ft, approaching OCA, report field in sight")
- Between 2NM and T/D altitude and heading instructions should be given each 1/2 NM.
- If pilot reports field in sight he can be transferred to TWR or can be given the landing clearance after coordination between APP and TWR
- If the pilot does not report the field in sight, ATC should remind him to go around or continue visually ("passing MAP, continue visually or go around" or "go around, follow published missed approach procedure")

Precision Approach Radar (PAR)

The PAR is very similar to the SRA but with better radar equipment to provide precise guidance. That's why it is considered a precision approach. If you have the ground radar plugin and its approach path function available for your airport, you can provide more accurate guidance to

undertake such an approach.

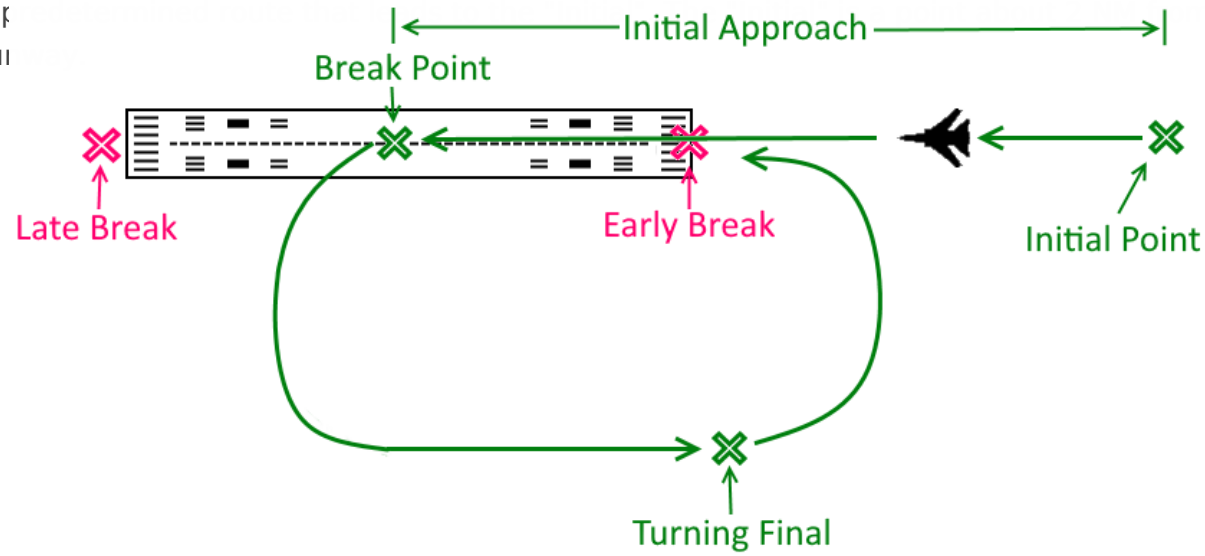
The main different to the SRA is that the controller does not stop talking so there is no time for the pilot to confirm any instruction. ATC continues talking until the threshhold of the runway.

If you want to get an idea watch this video.

You will notice in this video that in addition to heading instructions, ATC also gives information about the position of the aircraft in relation to centerline ("right of centerline", "correcting" etc.) and glide path ("below glide path" etc.) while in the SRA ATC only gives headings and recommends an altitude.

Overhead Approach Maneuver (Jet)

The Overhead Approach Maneuver is a visual procedure that is used at military airports for the use of military jets flying VFR. These jets usually carry a lot more kinetic energy than civil aircraft do and need to dissipate that energy before landing. For this purpose the procedure is published on military airports. This is equivalent to a carrier approach. You can find the charts in the German Military AIP designated as VAD. Some examples for airports with this procedure are ETHC, ETNG, ETSB, ETSH, ETNL, ETNT but there are more. In these charts you will always find an Entry Point and a p the ru



Overhead Approach Maneuver

The procedure after the Initial is depicted on the right. The Military jet will approach with 300 kts indicated airspeed and descend to the published altitude of the procedure. Usually, the published altitude is about 1000ft-2000ft higher than the airport elevation. The aircraft will then overfly the runway until reaching the break point. The standard break point is in the middle of the runway upon which the aircraft will enter a 3G turn to either side and decelerate in that turn. It is possible

to fly this procedure faster but then the pilots needs to pull harder and thus increase the centrifugal force in the turn. In simple words: The harder the pilot pulls the better the deceleration.

The jet will then continue in the traffic circuit while still decelerating. On downwind the pilot also puts down flaps and gear. The pilot should reach the approach speed before initiating the final turn. After about half of the final turn the jet will start descending towards the runway on which it will land. As you can see in the picture, the break can be flown early and late which gives ATC the opportunity to sequence aircraft in case ATC deems it necessary, however, because this is a visual maneuver, the sequencing should be done with traffic information and numbering.

In general, it is very easy to dissipate energy in this maneuver which is why it is preferable for military jets. Furthermore, this procedure minimizes the time that aircraft spend low and slow, thus, minimizing the time that these jets are most vulnerable.

Important points:

- Initial is a mandatory reporting point
- On downwind the pilot can be asked whether he intends to do a touch and go, low approach or full stop landing.
- This procedure is an easy way to dissolve a formation for individual landings if requested by the pilot. The formation will continue to the break point like with the normal procedure. At the break point the first aircraft will enter the break turn. After a few seconds the second aircraft will enter the break turn and this will continue until the last aircraft enters the break turn and the formation proceeds to land individually.
- As always with military jets: On Crosswind or final the pilot has to be reminded to check the landing gear "Check gear down" unless he has reported gear down before that point.
- To reemphasize: If published, this is the way that visual approaches ought to be flown in military jets unless a "straight in" visual approach is requested and accepted by ATC.

If you let a formation fly this overhead approach then they will break individually during the procedure and also land individually one after another. When the first aircraft is on downwind you can ask the pilot about his intentions. If he wants to do a final landing then you can ask all other pilots of the formation if they also want to do a final landing. If they confirm that they want to perform the final landing, you can clear the whole formation for landing at once (e.g. "wind 25005kts, runway 27 cleared to land as formation").

Below you find a Phraseology example for a published overhead approach. At this point ATC should already be in contact with the aircraft, should already have told the aircraft the runway in use, QNH and color code.

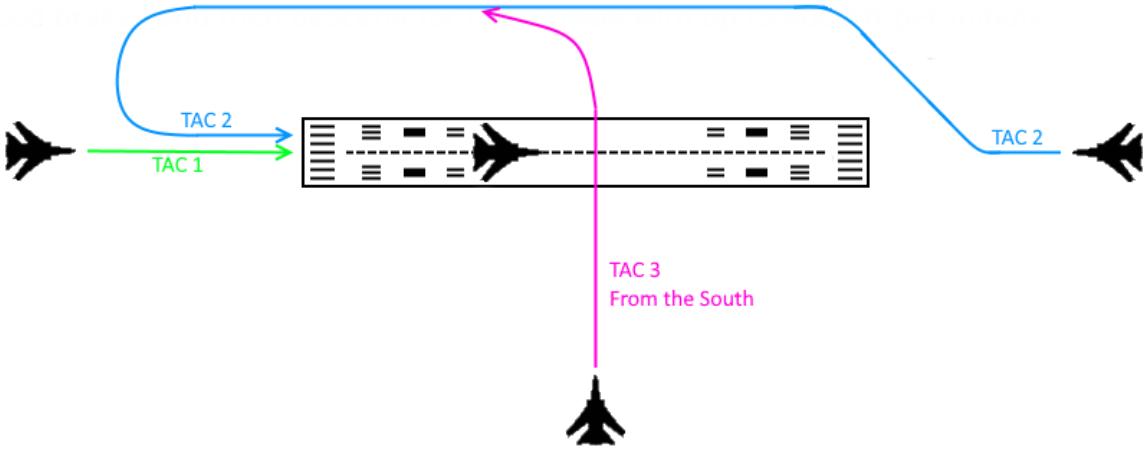
Station	Overhead Approach Maneuver
ETNT_TWR	GAF123, enter CTR via Entry East
GAF123	GAF123, enter CTR via Entry East
At Entry East	

GAF123	GAF123 at entry east, 1500ft
ETNT_TWR	GAF123, Roger, report initial
GAF123	GAF123, wilco
At Initial	
GAF123	GAF123, Initial
ETNT_TWR	GAF123, number 2, following EUFI on right downwind 26
GAF123	GAF123, Roger
On Downwind	
ETNT_TWR	GAF123, report intentions
GAF123	GAF123, Full Stop Landing
ETNT_TWR	GAF123, roger, wind 25005kt runway 26 cleared to land, check gear down
GAF123	GAF123, runway 26 cleared to land, gear down

In case you ever want to do this on an airport that has no published procedure for the overhead approach maneuver, you should tell the pilot the pattern altitude and the direction of the pattern. You also have to tell the pilot which initial to report(e.g. "runway 26, pattern altitude 1500ft, right turns, report 2 NM initial").

Transporter Tactical Approach

There isn't much to talk about for transporter approaches. In general Military transporters try to spend as little time as possible close to the ground. Therefore, the standard combat approach for a transporter is an approach that is as steep as possible. In general, transporters prefer to maintain altitude as long as possible. They will configure for landing like landing gear down, flaps and even s

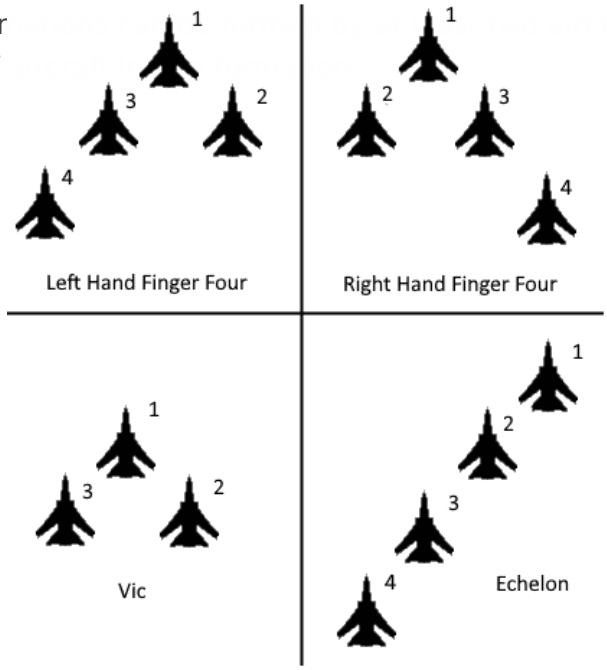


Transporter Tactical Approach

Additionally there are Transporter Tactical Approaches called TAC 1, TAC 2, and TAC 3 which can be seen in the picture of the right.They are designed to make the approach direction of a transporter less predictable by changing between TAC 1, 2 and 3. TAC 1 is basically the straight-in approach. TAC 2 is just like a circling approach and TAC 3 an approach orthogonally to the runway. TAC 3 has two directions it can approach from so additionally North, South, East and West should be added to specifcy which direction is used.

Formation Flights

It is very common for military jets (e.g. F-16, F-18) to engage in formation flying. In these formations the responsibility for separation lies with the pilots. Some notable examples of formations are the Four Finger Formation, the Echelon Formation and the Vic Formation depicted on the right. These forr aft, however, there is no upper limit for the amount of



Formations

All aircraft in a formation usually have similar callsigns. If the military aircraft are using airforce callsigns then the flight leader will be numbered GAF123A and all other aircraft GAF123B, GAF123C etc. The flight leader will use the callsign GAF123 Formation when talking to ATC. If military aircraft are using tactical callsigns they will be numbered SABRE1, SABRE2, SABRE3 etc. The flight leader will use the callsign SABRE Formation when talking to ATC. No matter which callsign is in use, inside the formation the pilots will only refer to each other by using numbers as depicted on the right.

For ATC formations are handled like a single aircraft. Only the flight leader will have the transponder turned on and only he will communicate. You as ATC can disregard all other aircraft inside the formation. However, due to the fact that formations take up more space than single aircraft, we have to increase the horizontal separation from other aircraft to formations by one additional mile.

All Approaches and Departures can be flown by formations. That means that it is possible for formations to depart or land as a formation. In that case the runway needs to have a width of 45m for departure and 120m for landing. During the previously mentioned "Overhead Approach Maneuver" the formation will split automatically without any need to interfere by ATC.

Although only the flight leader will communicate with ATC, all elements of the formation have to listen on the active frequency. That means when the formation switches the frequency, there will be a short check by the formation when switching frequency as shown in the example below.

Station	Phraseology during frequency change
EDGG_GIN_CTR	GAF123, Contact Bremen Radar on 123.125
GAF123A	GAF123 Formation, Contact Bremen Radar on 123.125
After frequency change on frequency 123.125	
GAF123A	GAF123 Formation, check
GAF123B	Two
GAF123C	Three
GAF123D	Four
GAF123A	Bremen Radar, GAF123 Formation FL220

Formation Splits

Reasons for formation splits can be operational reasons, weather or because formation landings are not possible. Especially in case of weather it is possible that elements of the formation lose visual contact with their wingmen. This is an emergency situation and must be resolved immediately. Most of the time the pilot will initiate the split and announce the emergency on frequency.

Plainly said: To split a formation one only needs to assign any instruction that will separate an aircraft from the formation. In case there are multiple aircraft, the split has to be performed one aircraft at a time! Methods to split the formation are

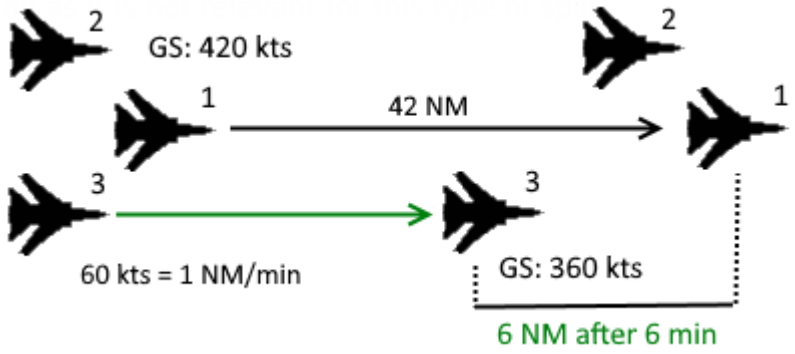
- Longitudinal split by using speed adjustment
- Vertical split by using climbs/descends
- Lateral split by assigning different vectors
- Combinations of the above.

Formations are only performed on request of the pilot(s). In IMC the split should not be performed in turn or descent unless requested so by the pilots. For ATC it is very important to know if the aircraft, that needs to be split from the formation, is able for a certain type of split. You do not need to know where every aircraft in the formation is but you need to ask whether the formation is able for a split turn or any other split. For example, when the splitting aircraft is on the right side of the formaiton, a left turn split will not be possible unless the pilot is given enough time and warning to move to the left side of the split. Especially when requesting a split by turning, the pilot should report which direction they are able to turn to.

The Formation split is considered accomplished when the pilot reports having passed or reached a level that is sufficient to provide vertical separation. The identification of the aircraft that is split from the formation should be done as soon as possible and before radar separation is established. Below you find examples and explanations for the three ways a formation split can be performed

Longitudinal Formation Split by Speed Adjustment

For a Formation Split by speed adjustment you have to know the indicated airspeed of the formation. You can then assign a speed to the aircraft that needs to be split from the formation. Make sure that it is a significant speed different (e.g. 60 kts) because otherwise the split takes unnecessarily long. In this case you do not need to know the positions of the aircraft within the formati



Split by Speed Adjustment

As you can see in the picture, the number three, GAF123C, is assigned a 60kts speed difference. With 60 kts it takes 6 minutes to reach the required 6NM horizontal separation (5NM plus 1 NM because it is horizontal separation to a formation). This takes 42 NM without taking the decceleration period into consideration. As you can see, this should only be performed if enough flying distance is available. Especially when another split needs to be performed between one and two, this will take another 42NM. Below you can find an example for the phraseology with three aircraft in the split, GAF123A, GAF123B and GAF123C.

Station	Longitudinal Split by Speed Adjustment
GAF123	GAF123 Formation, request split for individual approaches, C is number one
ATC	GAF123 Formation, report indicated airspeed and ready for split by speed
GAF123	GAF123 Formation, speed 300kts indicated, ready for split
ATC	GAF123 Formation, for split maintain speed 300 kts, GAF123C, reduce speed 240 kts
GAF123	GAF123 Formation maintaining speed 300 kts, GAF123C reducing speed 240 kts
ATC	GAF123C squawk 2114

This may be repeated for GAF123B in order to complete the split.

Vertical Formation Split

This is generally the fastest way to achieve the formation split. It takes only about 5 NM to achieve radar separation in this case. However, it also results in two aircraft on top of each other that will need to get individual approaches which can unnecessarily complicate the traffic situation in an approach airspace. In this case you do not need to know the positions of the aircraft within the formation as it is not relevant for this type of split. The Phraseology example is again given for a formation with three aircraft, GAF123A, GAF123B and GAF123C. This time we will also split GAF123B. The formation is flying on FL170.

Station	Vertical Split
GAF123	GAF123 Formation, request split for individual approaches, C is number one
ATC	GAF123 Formation, report ready for split by descent
GAF123	GAF123 Formation, ready
ATC	GAF123C for split descend FL150, report passing FL 160
GAF123C	GAF123C descending FL150, report passing FL160
ATC	GAF123C squawk 2114
GAF123C	GAF123C squawk 2114
ATC	GAF123C identified
GAF123C	GAF123C passing FL160
ATC	GAF123C Roger, GAF123 Formation, report ready for split by descent
GAF123	GAF123 Formation, ready
ATC	GAF123B for split descend FL160, report reaching FL 160
GAF123B	GAF123B descending FL160, report reaching FL160
ATC	GAF123B squawk 2115

Lateral Formation Split

In this case the time it takes to split the formation depends on the angle between the aircraft that is split from the formation and the formation. Generally a 20-40° angle between formation and

splitting aircraft is advisable. In this case it takes 16 NM to reach 6NM horizontal separation with a 20° angle, 11 NM with a 30° angle and 8NM with a 40° angle. Any angle above 40° does not significantly increase the distance it takes to perform the split and achieve the required spacing. Again the previously mentioned example is given below. This time it is very important that ATC knows where the aircraft are inside the formation. Of course it is also possible to use orbits and "three-sixties" to accomplish a split but that is not recommended at high speed or high levels.

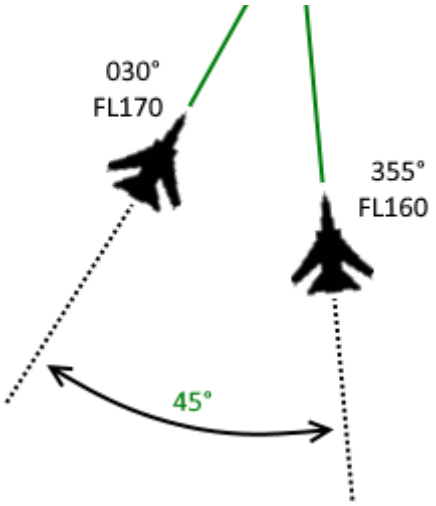
Station	Lateral Split
GAF123	GAF123 Formation, request split for individual approaches, C is number one
ATC	GAF123 Formation, report position of C
GAF123	GAF123 Formation, C is on the right hand side
ATC	GAF123 Formation, report ready for (right turn) split
GAF123	GAF123 Formation ready
ATC	GAF123C for split turn right by 30°
GAF123C	GAF123C for split turn right by 30°
ATC	GAF123C squawk 2114

Another example when a right turn split is not possible but C is on the right hand side.

Station	Lateral Split
GAF123	GAF123 Formation, request split for individual approaches, C is number one
ATC	GAF123 Formation, report ready for left turn split
Give time for C to position on the left hand side	
GAF123	GAF123 Formation ready
ATC	GAF123C for split turn left by 30°
GAF123C	GAF123C for split turn left by 30°
ATC	GAF123C squawk 2114

Formation Join Up

In some cases aircraft will start individually and form a formation later. This is also necessary when a Jet aircraft joins a tanker formation to perform air to air refueling.



Vertical Formation Join Up

The following general guidelines need to be considered for a join up:

- the Join Up should be performed in VMC
- especially with limited visibility the join up should be performed vertically. Avoid cleared conflicts at all times!
- The intercept angle between both aircraft should not be greater than 45°
- ATC is required to maintain radar separation until the pilot reports the other aircraft in sight and the join up is approved. From that point onward the pilot is responsible for separation to the aircraft that he is joining up to.
- The formation may only be handled as a formation (handled as if it were one aircraft) when the flight leader has reported "FORMATION TIGHT"
- Before the formation is tight HDG and level changes should be avoided and if necessary only made with the consent of both pilots.

As you can see in the picture on the right, all guidelines are obeyed. The Join up is performed vertically with an intercept angle of a maximum of 45°. There is no cleared conflict. Both aircraft should be vectored to a distance of roughly 3NM before initiating the visual join up to make it easier for the trailing pilot to visually spot the preceding aircraft. Below you find a phraseology example for the formation join up.

Station	Formation Join Up
GAF123B	GAF123B request to join GAF123A
ATC	Roger, GAF123A report flight conditions and heading
GAF123A	GAF123A HDG030, VMC
ATC	GAF123B Fly Heading 355, climb FL 160
GAF123B	GAF123B Fly Heading 355, climb FL 160
When close to 3NM	

ATC	GAF123B Alpha is 10 o'clock, 3NM converging, FL170, report in sight
GAF123B	GAF123B Alpha in sight
ATC	GAF123B approved to join visually, report formation tight
GAF123B	GAF123B joining visually, wilco
After the formation has been formed	
GAF123	Langen Radar, GAF123 Formation, Formation Tight
ATC	GAF123B squawk standby

Air to Air Refuelling (AAR)

What is Air to Air Refueling (AAR)?

AAR is a procedure established to refuel aircraft midflight and thus enable longer flight time. AAR can be either done on a specified air refuelling anchor or en-route on previously coordinated routes or standard AAR routings. For germany, Air Refuelling Anchors are published in GEMIL FLIP MAP, publicly available here: https://www.milais.org/publications.php.

What are the roles for an AAR?

Tanker: The aircraft used to refuel the receiver(s).
Receiver: The aircraft being refueled by the tanker.

AAR within a published air refuelling anchor.

Air refuelling anchors are predefined procedures, often located within an ED-R/TRA and similar to a civil holding procedure. The conduct of air refuelling within a pusblished air refuelling anchor normally requires four flight levels on top of each other. The lateral and vertical dimensions of the anchor are defined on the respective anchor chart in GEMIL FLIP MAP. Let's look at the GRETCHEN anchor, located within ED-R 207 (TRA Allgäu) as an example:

[CHART NOCH EINFÜGEN]

Laterally, the anchor is defined by the means of four anchor points (AP/TP 1 and 2). Vertically, the anchor extends from FL270 up to FL300.

Use of flight levels within the anchor.

The flight levels within a defined air refuelling anchor shall be used as described here:

FL A: Alternate flight level
The FL above the tanker shall be kept clear for safety actions or exit possibility.

FL B: Refuelling base level
The FL actually used for the refuelling, actual FL of the tanker.

FL C: Entry level of the first receiver(s)
FL below refuelling base level. Used as entry level for the first receiver(s) if no other aircraft is in formation with the tanker. This FL shall be kept clear as long as receiver(s) are in formation with the tanker, used by receivers to descend in an emergency situation.

FL D: Entry level of further receiver(s)
FL below entry level of the first receiver(s). Used as entry level for further receiver(s) if other receiver(s) are already in formation with the tanker.

Separation to and within air refuelling anchor.

Other traffic shall be separated by the applicable radar or vertical separation from the tanker. During tanker formation (tanker and receiver), the radar separation shall be increased by 1 NM. The vertical separation minima shall be maintained above FL A and below FL D.

Within the anchor, the required separation between tanker and receiver shall be maintained until the receiver reports the tanker in sight and has been cleared to change to refuelling frequency (also called "boomer" frequency).

If the anchor is located within an ED-R/TRA, further missions in the area shall be vertically separated by 2000 ft above FL A and below FL D.

Control Procedures for Tanker and Receiver aircraft.

Following control procedures shall be applied for the conduct of AAR:

Tanker aircraft.

After initial contact has been established with the tanker aircraft, the tanker shall be cleared to enter the anchor area:

> "*(Callsign), cleared to enter GRETCHEN anchor FL290.*"

When tanker is within the anchor area, the tanker pilot shall inform ATC about flight conditions (IMC/VMC), possible contrails, refuelling frequency and refuelling speed:

> "*(Callsign), report flight conditions.*"
> "*(Callsign), are you trailing?*"
> "*(Callsign), request boomer / refuelling frequency.*"
> "*(Callsign), report fuelling speed.*"

The tanker shall be informed about the number, type and callsign of the receiver(s) as well as the estimated beginning of the rendezvous manoeuvre as soon as possible:

> "*(Callsign), you receivers are (number) (type), (callsign of receiver), expect rendezvous in (time) minutes.*"

Receiver aircraft.

If no other receiver are in formation with the tanker, first receivers shall be guided to the tanker at FL C. Further receivers at FL D.

After initial contact, receivers shall be informed about callsign, position, refuelling speed and frequency of the tanker. Additionally, they shall be instructed to check the armament safety (switches safe = all weapon switches set to SAFE/OFF) and air pressure setting.

> "*(Callsign), tanker call sign is (callsign of tanker), refuelling speed (speed).*"
> "*(Callsign), tanker position is (position), squawking (squawk of tanker), he is (not) trailing.*"
> "*(Callsign), check switches safe and altimeter settings standard.*"

While approaching the anchor area, the receiver shall be instructed to report radar contact with the tanker:

> "*(Callsign), report radar contact.*"

Position information about the tanker shall be given at intervals of 10 NM until receiver reports radar contact (also called "Judy").

If radar contact is not reported, the receiver shall be instructed to report visual contact with the tanker:

> "*(Callsign),* report tanker in sight."

As soon as the receiver reports radar or visual contact, he shall be instructed to:

- squawk standby,
- obtain ATC clearance before leaving the refuelling level block,
- in case of visual contact: check nose cold (radar of receiver set to standby),
- establish radio contact with tanker on boomer frequency.

> "*(Callsign),* squawk standby, (check nose cold), for clearance call back on (this) frequency, contact boomer on (boomer frequency)."

Enroute refuelling on standard AAR routings

For the purpose of connecting military aerodromes and exercise areas, enroute AAR routings have been established and are published in ENR 5.2 MILAIP Germany.

[CHART NOCH EINFÜGEN]

These routes are only available in FL210 or FL220, depending on the definition in ENR 5.2 which is complying with the semicircular level assignment rule. The rendezvous points shall be indicated by STAY indicator in FPL, additionally a RMK/ENR REFUELING shall be added in Field 18.

Merging tanker and receiver aircraft shall be handled like a formation joinup.

Refuelling shall not take place before the formation is following the respective AAR routing.

The tanker pilot shall:

- obtain approval before refuelling starts ("request approval to start refuelling.",
- provide information about the actual refuelling status ("currently refuelling"/"currently not refuelling") each time he establishes radio contact with a new sector,
- inform when the actual refuelling is finished ("refuelling finished").

Changes to the route of the refuelling formation shall only be made on request or with the consent of the tanker. Exceptions shall only be made for safety reasons or to give way to flights with higher priority.

Scramble

Officially a "Scramble" is a Security Flight. This can either be an Alpha-Scramble (Actual Scramble) and a Tango-Scrample (Training Scramble). The idea is that a military jet (e.g. multirole combat aircraft, interceptor etc.) on the ground takes off with the goal to intercept another aircraft for defense of the airspace. For ATC the goal generally is to reduce time loss on ground and give the aircraft priority. A-Scrambles have this priority during the entire flight and are the second priority just behind emergencies. T-Scrambles also receive priority (like government flights) but they are a lower priority than A-Scrambles (also lower than Search and Rescue and flights carrying sick/ill passengers).

Remember that A-Scrambles and T-Scrambles are only permitted on VATSIM if all pilots involved are members of a VSO and agree to the procedure.

General notes:

- During Departure ATC is in control of the aircraft, however, especially HDG and level would have to be given from the responsible defense authorities. Otherwise it is a normal military departure with priority.
- Headings are called "Vector" and Flight Level are called Angels -> Vector 050, Angels 22 means HDG 050, FL220
- Enroute the Military jet would be handed over to the responsible defense authority. However, ATC needs to know where the scramble is heading and has to keep all other traffic away from the scramble (maintain separation, especially in case of an A-Scramble!)
- For the return the scramble is again under control of ATC. An A-Scramble is then degraded to a T-Scramble and should be allowed to fly the shortest possible routing.