
DCS World Air to Ground Tutorial For the F-5E Tiger II



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1 Introduction

1.1 Why this Document?

Tutorials for DCS World are numerous. If you search Youtube, the number of videos is stunning. Unfortunately, I find videos as tutorials for a complex thing like flying a fighter jet only of limited use. If you know already what you are doing, the videos can give a good best practice support. If you have to learn how to do things in the first place, the videos are too fast.

Reading the manual is always a good start but unfortunately not helpful for training purposes either, as the descriptions are technical and not particularly user oriented. The “Chuck’s DCS tutorial Library” is a very good and beautifully pictured series of tutorials for most of the aircraft available in DCS. But again the document has a general structure and to actually fly a mission, it needs a more hands on approach. This is what I want to achieve with this document.

Please be aware English is not my native language. I apologize for all misspellings, grammar mistakes and strange wordings this document may include. I hope the understanding will not be jeopardized.

1.2 What does this Document provide?

This document describes an air to ground training mission with the F5E Tiger II module in DCS on the Caucasus Map. It is assumed that you know how to fly in a flight sim and have a general understanding of how DCS works and what air plane you are flying. The tutorial describes, how to get the aircraft started and into the air. Further on, it describes how to deploy weapons with the F-5E Tiger II. Finally, it is described how to safely land the aircraft.

The provided mission is a training sortie. Targets are placed on a bombing range without any air defence. This should give you the opportunity to learn how to fly and fight in this aircraft. The document is supplemented by a mission file (“A2G-F5E.miz”). After placing this file into your appropriate DCS directory, you can fly the described mission to practice what you have read before.

Additionally I have provided a checklist for the mission. It is not based on official checklists available on the internet, but tailor-made to the needs of DCS World F-5E missions. The flight preparation described in this document is actually based on this checklist. The idea is that after reading the tutorial off line, the full document should help to execute the mission for the first time using the “Pause”-function extensively. Later, the checklist should be enough to execute the flight successfully. After this mission has

become second nature it will be easy to add new weapons and aircraft systems to be used.

1.3 The Structure of the Document

After this introduction the document is divided into three chapters:

- **Startup and Take Off**

This chapter describes the startup procedure of the aircraft from a cold and dark cockpit with starting the engine(s) and setting all systems as required. After this, the rolling of the aircraft onto the runway and the take off are described.

- **Weapons Delivery**

This chapter describes how the different weapons are utilized from the in-cockpit and from the flight manoeuvre perspective.

- **Return and Landing**

This chapter describes how to get back to the airfield and land successfully, which sometimes is one of the most challenging parts of the mission

1.4 Your Aircraft

Your aircraft is a F-5E Tiger II, that is provided as an DLC for DCS World by Belsimtek. You need to own this DLC to fly this mission. The module features a professional flight model, a highly detailed 6-DOF cockpit and a simulation of virtually all relevant systems of the aircraft. As the aircraft is quite simple the module is relatively easy to learn and the lack of advanced systems emphasizes the need to concentrate on flying instead of system management. The ground attack role is not the primary focus of the design, which means air to ground missions are of limited effectiveness.

1.5 The Mission

The Mission description is as follows:

Your country only lately gained independence. Your country is located in very unstable surroundings. Building up an army is necessary. You are part of a team to build an airforce for your country from scratch. Financial resources are scarce, so it needs to be determined, which airplane(s) to buy. Either the airforce acquires a multi role fighter bomber or a dedicated groundpounder plus a dedicated air superiority fighter. Several aircrafts are on offer. You had the opportunity to get some basic training on each of them. Now a practical shootout is planned. All aircraft on offer are stationed on the airport of Senakhi-Kolki. A bombing range has been build on a deserted

airfield near Batumi, which is easily recognisable from the air due to its unique x-shaped runways. Some training targets are placed on the range. There are two ammunition bunkers on the south end and three fuel tanks on the northern part. Your aircraft is armed appropriately to destroy the targets. Two US F-18C Hornets are assigned to provide fighter cover during the exercise to avoid interference by neighbouring countries. For attacks with the fighter bomber aircraft the targets have no air defence whatsoever. If all targets are destroyed and the plane is returned safely to the base, 100 points will be granted to the pilot. Today the Northrop F-5E Tiger II will be tested. It is 07.00 hour and the weather is fair and stable. You have been tasked to fly the first test flight with the F-5E Tiger II. Good luck.

Your aircraft is parked with a cold and dark cockpit on the apron. It is 07.00 hours. The weather is pretty nice and stable. The F-5E Tiger II is armed and fueled as described and ready to fly. The target is approximately 30 miles from your airport, which means the mission can be accomplished in roughly half an hour. External fuel is therefore neither required nor installed.



Figure 1.1: Bomb Load of your F-5E

Due to its unique shape, the target area is easily recognisable from the air and looks as follows:



Figure 1.2: Target area viewed from the air

1.5.1 The Targets

Two ammunition stores are located on the southern end of the airfield. The stores are bunkers and require a direct hit by a reasonable bomb in order to be destroyed. On the northern part of the airfield three fuel tanks have been installed. This is what the target area looks like:



Figure 1.3: The two ammunition bunkers

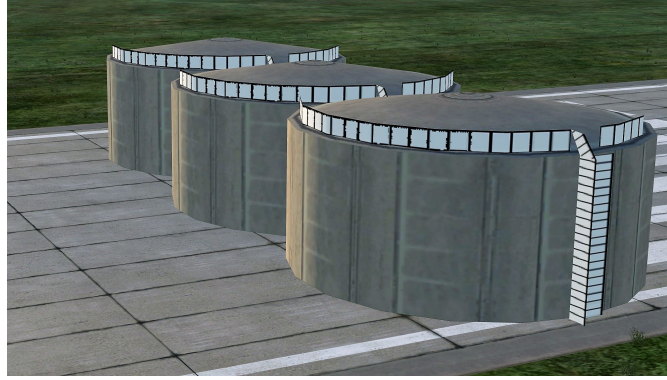


Figure 1.4: The three fuel tanks

1.5.2 Mission Success

The destruction of an ammunition store has a score of 25 points and of a fuel tank of 10 points. A safe recovery with your plane to the airport yields another 20 points. A complete mission success should therefore be awarded with 100 points. Unfortunately I could not figure out so far, how to test for a successful return and awarding points for it. Hence for the time being the maximum score to be achieved is 80.

2 Startup, Taxi and Take Off

2.1 Situation

Your aircraft is parked on the ramp of the airfield of Senaki-Kolkhi. For better orientation, this is your location on the airport:



Figure 2.1: Location on ramp

The sun is still low, which means flying east might pose a visibility problem!

2.2 Startup

2.2.1 Engine Startup

The F-5E Tiger II cannot start its engines without external ground support. This means we have to call for ground support first.

- Call ground crew for air supply: \, F8, F5, F1
(To call ground Crew you neither need electricity nor turn on the radios, as the guys are standing right next to your aircraft.)
- Turn on battery, left and right generators and left and right booster pumps. To talk to ATC we need to turn on the radio as well (UHF on “Main” and dial in the frequency to 132.00 for ATC on Senaki-Kolkhi).



Figure 2.2: Engine startup



Figure 2.3: Turn on radio

- Call tower for clearance to start the engines: \, F5, F1, F3
(You might need to repeat this, as sometimes ATC does not answer the first call)
- Turn on the lights and let the lights flash to warn people about the imminent start of the engines



Figure 2.4: Turn on lights

- Call ground crew to apply air pressure: \, F8, F5, F3
- Close canopy by pushing the lever on the left side of the cockpit (for noise reduction reasons)
- Now the left engine will start to turn and when the instruments show 10% rpm, you need to press the left engine start button and push the left throttle to idle.



Figure 2.5: Engine starter buttons

As this only works on specific gaming hardware, the rest should press the “Right Alt-Home Key”. Now we have to wait, until the engine has started and stabilized (49% to 52% idle RPM).

- Call ground crew to apply air pressure for the other engine: \, F8, F5, F3
- Now the right engine will start to turn and we repeat the exercise. This time press “Right Shift-Home Key”.
- Now we ask ground crew to disconnect air supply: \, F8, F5, F2

2.2.2 System Startup

The engines are now running and we need to set up the required systems for flight:

- Retract air brakes by setting air brake thumb switch forward (right mouse click) and set flap thumb switch to “AUTO” (two left mouse click on thumb switch).

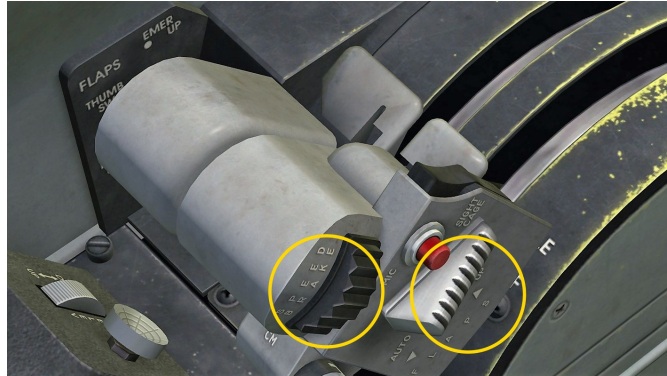


Figure 2.6: Air brake and flaps

- Enable Yaw and Pitch Dampers.



Figure 2.7: Yaw damper

- Set Oxygen Supply Switch to ON (forward).



Oxygen supply

- Set Primary Attitude Indicator pitch trim to 3 degrees, uncage the Standby Indicator and turn pitch to 3 degree also.



Figure 2.8: Front dash with attitude indicators

- Set Pitot Heat switch to on, but not the Engine Anti-Ice switch, as this reduces power and is not necessary at the temperatures given and costs engine power.



Figure 2.9: Pitot heat

- Turn on the Radar Warning System (RWR) by pressing the power button.



Figure 2.10: RWR

- Set Pitch Trim for Take Off (in this case to 9). Be aware the gauge is difficult to see from the normal position in the cockpit.



Figure 2.11: Pitch trim

- Turn on the TACAN receiver on T/R (Transmit and Recieve) and select “31X”, which is the frequency of the TACAN installation in Senaky-Kolkhi.



Figure 2.12: TACAN

- Turn ADI- course knob to 88%, which is the magnetic direction of the active runway. The TACAN will help us to return safely to our base, but is not required.

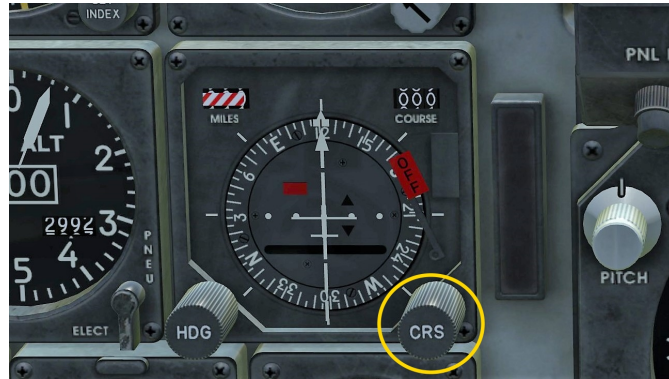


Figure 2.13: ADI

2.2.3 Weapons Startup

Now we are ready to fly, but not ready to fight. Please keep in mind, that the aircraft has no autopilot function whatsoever. That means that system management in the cockpit during flight is difficult. Therefore, we want to prepare as much as we safely can to reduce workload while flying. To prepare the weapons, we do the following:

- Power the armament pylons 3 and 5 (these are the pylons with the MK-83 bombs). We will first attack one of the ammunition bunkers with these two bombs and arm the bombs for tail fuse to ensure that the bombs penetrate the bunker before detonating.



Figure 2.14: Weapon panel

- Turn on the Gun Sight to manual (MAN) and set Gun Sight depression to negative (downwards) 79.



Figure 2.15: HUD panel

Now the aircraft is ready to taxi, all relevant systems are up and running. Please note that the radar is air to air only, not even distance measuring is provided. Therefore we do not turn on the radar at all in this mission.

2.3 Taxi and Take Off

For take off keep in mind that the plane is quite heavy and the drag is high due to the external storage of the weapons. Therefore the aircraft needs to be handled with care after take off!

- Call tower for clearance to proceed to runway: \, F5, F1, F1
Clearance will be given to runway 09. Your way to the runway looks as follows:



Figure 2.16: Roll direction

- Turn on taxi lights.



Figure 2.17: Taxi lights switch

- Increase throttle until the aircraft starts moving, then reduce throttle immediately to avoid excessive acceleration. Keep in mind that the aircraft is quite heavy. In case you need to steer, press and hold button “S” and use rudder to change direction. Release the “S” key only after the new direction is achieved and stabilised.
- Hold short on the runway entrance and call ATC to acquire clearance for take off: \, F5, F1, F1
- Enter runway after clearance, align with the runway centre line and come to a complete stop.
- Adjust Altimeter pressure to the actual pressure provided by the ATC.
- Raise front wheel to shorten take off run.

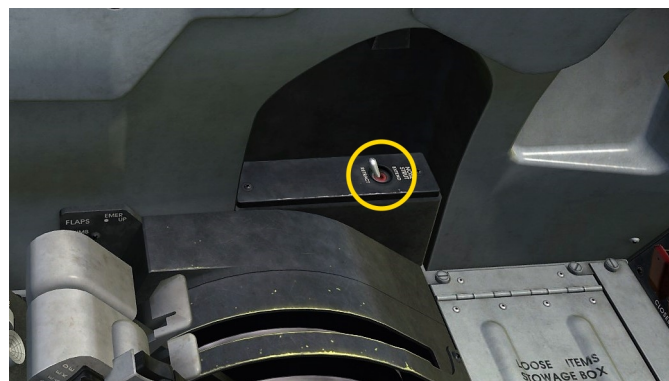


Figure 2.18: Raise nose wheel

- Press “W” to apply brakes and increase throttle to 90%.
- Release brakes and increase throttle to full afterburner. It is normal that it takes a few seconds, before the afterburner kicks in. Keep aircraft on centreline with

rudder. Use “S” key only until 80 knots are reached. Otherwise you will over-steer the plane. If you lined up properly, you will not need any corrections.



Figure 2.19: Line up on runway

- When 150 knots are reached pull back stick gently and wait until the aircraft displays a positive rate of climb. Retract landing gear and avoid excessive climb by trimming downwards. Do not turn, until you reach a speed of 220 knots minimum. Then turn on a course of roughly 230° and continue to climb to an altitude of 6000 feet.



Figure 2.20: Rotation



Figure 2.21: Climb

2.4 Enroute Flight

You are now safely flying and it is time to prepare the aircraft for the fight. Make sure, the aircraft is as stable as possible, while climbing, as the lack of an autopilot means, you have to manipulate certain items in the cockpit with the mouse and therefore release the stick momentarily.

- Turn off the flashing light.
- Turn off the navigation light.
- Initiate the fuel balance system to “Left Low” to avoid imbalances.



Figure 2.22: Balancing the fuel

- Turn the weapon knob to “Bomb”.



Figure 2.23: Management of external stores

3 Weapons Delivery

3.1 General Tactical Considerations

Our targets are two ammunition bunkers and three fuel tanks that are located very closely to each other. To safely destroy an ammunition bunker, you need to drop some heavy ordnance on it. For the fuel tanks, high explosive rockets are a good choice. To destroy the targets, your aircraft is loaded with:

- two MK83 general purpose bombs, with 445 lb Tritonal explosive each (inner wing pylons)
- one MK84 general purpose bomb, with 945 lb Tritonal explosive (centre pylon)
- two rocket pods (LAU-60) with 19 rockets each (outer wing pylons)

Two MK83 or one MK 84 carry more or less the same amount of Tritonal. Using this load out is advantageous, as no asymmetrical load can occur. This choice of bombs provide for enough punch in any single run. We want the bombs to not detonate on, but in the bunker. Therefore we use the rear fuse arming for the bombs. As the three fuel tanks are located very close to each other, it is assumed that they can be destroyed all by one single burst with all available rockets. The firing mode for the rockets cannot be altered from the cockpit, ground crew already armed the rockets in a way that all rockets will be fired in one burst. In case the rockets miss, you might attack again with the internal guns. We plan to do three consecutive attack runs:

- On the first run, we use the two MK83 bombs to attack one of the bunkers
- On the second run, we use the MK84 bomb to attack the remaining bunker
- On the third run, we attack the three fuel tanks with the rockets

Please keep in mind that this is a training/tutorial mission. In real combat it would be suicidal to attack a single target area several times in a row. Additionally as the distance to the target is usually much longer, you would need external fuel, so that the weapons load would be restricted anyway. To make the training as efficient as possible in peacetime, this simplified set-up is used.

It is early in the morning and the sun is just rising. If you attack the target area from the west, the sun will shine upfront into the cockpit. This means, after any attack run the pilot should turn into the sun, climb to gain altitude and start the next run with the sun at our back.

3.2 Bomb Delivery with the Tiger

3.2.1 How to Aim

The F-5E Tiger II is a pretty simple aircraft. No fancy CCRP bombing options are available. At least our DCS version of the Tiger cannot deliver smart weapons. We have to use CCIP bombing (that means dive bombing with unguided free fall bombs). Targeting is all visual and by aiming with the aircraft itself.

Sitting in the cockpit we are looking on a piece of glass, called the HUD (Heads Up Display), which usually is a fancy instrument to aid pilots in their tasks. In our case of air to ground attacks in the F-5E Tiger II the HUD simply displays a fixed reticle and nothing else. At least the reticle is manually movable up and down to make up for the fact that a bomb is not falling in a straight line but in a ballistic curve. If you fly in a defined pattern you can adjust the reticle to ensure that the bomb will hit, where the reticle shows. The following table shows you the manoeuvre that is required to ensure a hit by a given grade of the reticle:

Parameter	20 degree Dive	30 degree Dive
Dive initiation altitude, feet	5000	6000
Dive speed, knots	350	350
Release altitude, feet	1500	2000
Release speed, knots	380 to 400	440 to 450
Reticle depression, mils	80	79

Figure 3.1: Dive bombing parameter

If you manage to guide your aircraft to the target within the given parameters and the reticle is on the target in the moment of release, you will hit the target precisely.

3.2.2 Approach on Targets

We are flying at 6000 feet on course to the bombing range. As soon as we get a visual on the range (easy to recognise with the x-shaped runways), we manoeuvre the aircraft in a way that we have the target area to the left of our flight path. In doing so, we can remain our visual while approaching the target. When the target area is to the left of our cockpit, we cut the throttle, turn left and initiate a dive to the target.



Figure 3.2: Approaching the target



Figure 3.3: Turn in to dive attack

3.2.3 The Attack Dive and Recovery

To ensure that the speed will not become excessive we deploy air brakes. In the dive we aim with the reticle at one of the ammunition bunkers and release the two MK84 bombs at an altitude of 2000 feet. After release, we immediately pull the nose up (make sure to not exceed 4g), retract air brakes and throttle up. The following picture shows a cockpit view at the point of release. On the instruments, you can see the altitude (2000 feet), the speed (370 knots) and the dive angle of 30 degree.



Figure 3.4: Release - Cockpit view

The next picture shows the same moment from the outside just after dropping the two MK83 bombs.



Figure 3.5: Release - External view

The last picture shows the moment of impact of the bombs on one of the two bunkers.



Figure 3.6: Hit the target

As you can imagine, this manoeuvre needs to be practiced extensively to achieve a meaningful probability of a hit. Please keep in mind that 1500 feet to 2000 feet at the given speed and dive angle do not provide too much of a margin for a safe discovery, specifically if you have remaining weapons loaded, as they will add to your weight and you must not pull more than 4g (better less) to not overstress the hard points. As you can see lots of airmanship and continuous training is required to successfully deliver bombs in the F-5E Tiger II. And this is what this training mission is designed to accomplish.

3.2.4 Second Run

After recovery from the dive we turn east and start to climb back to 6000 feet for our second bombing run. Now we power pylon 4 (the centre pylon) and turn off pylons 3 and 5. After climbing back to 6000 feet we turn back to the target area and repeat the bombing run, as described above, now aiming at the second ammunition bunker.

3.3 How to deliver rockets

Firing rockets on a target is very similar to dropping bombs. First, we have to select the pylons 2 and 6 and to deselect any other pylons selected. Then, we have to turn the weapon knob to “RKT/DISP”. Now we adjust the the setting of the reticle according to the table below. After firing, the rockets will accelerate, which means the rockets will hit the targets before the aircraft is passing by. That means that immediately after weapon release the aircraft should turn to one side to avoid flying through the explosion in front of it. The table for the rocket delivery is as follows:

Parameter	20 degree Dive	30 degree Dive
Dive initiation altitude, feet	5000	6000
Dive speed, knots	350 to 370	350
Rocket firing altitude, feet	1500	2000
Rocket firing speed, knots	400	400
Reticle depression, mils	14	10

Figure 3.7: Unguided rockets parameter



Figure 3.8: Rocket release

4 Return and Landing

After delivering the weapons payload and hopefully hitting the targets, it is time to return to base. To avoid disturbance of civilian life, we turn westward to the sea and then north to fly back along the coast.

For the “Fence Out” we do the following:

- “External Store” knob to “Save”.
- “Guns” knob to “Off”, (if guns have been armed).
- Turn on navigation and strobe light again.

For our return, we climb back to 4000 feet at a speed of 300 knots and follow the coastline to the north. It is hard to see something to the east, as the sun is still rising. Now the TACAN navigation system comes in handy. It is not an ILS but can help to bring the air plane on the approach path to the airfield even with poor visibility.

During take-off preparation, we have tuned in the TACAN of Senakhi-Kolki and turned the “Course” knob of the HSI to 88 degrees. The needle of the HSI will now show us, when the aircraft is crossing the approach path, which happens to be 88 degree taking into account the local compass variance. At that point, we turn the aircraft east to follow the approach path as indicated on the HSI.

Specific preparations of the aircraft for landing are not required. We chose to use the automatic flaps when we started the aircraft and this will take care of the flaps as soon as the landing gear is extended.

On the top left of the HSI we can see the distance to the airport, which will be a bit more than 20 miles.

- When the aircraft is aligned to the approach, we start to descent to 3000 feet by maintaining 300 knots.
- As a rule of thumb expect the necessary glide slope to be 1200 feet per minute.
- Make sure your descent is finalised before you are 3 miles out of the airfield.
- Reduce speed to 165 knots before you reach the 3 mile threshold, eventually using the speed brakes.
- Extend landing gear when speed is getting lower than 200 knots.
- Descent at a rate of 1000 feet per minute and slow down to a final approach speed of, in our case, approximately 157 knots.

- On final approach descent to 400 feet per minute.
- Flare at 20 feet above the runway by gently pulling the stick aft and touchdown at 145 knots.
- Although not always required, I personally pull the brake chute to decelerate quickly on the runway avoiding heating stress on the brakes and the tires.
- Release brake chute when speed is below 50 knots.
- Leave runway and come to a complete stop.

How do we find out, what the required approach speed is? All weapons have been expended and it is assumed that you did not need the guns to destroy the tanks. The remaining fuel is approximately 2500 pounds. The formula to calculate the approach speed is as follows:

- Approach Speed = $145 + 5$ (if gun ammo is still on board) + $((\text{fuel quantity remaining} - 1000)/200)$
- Approach Speed = $145 + 5 + ((2500-1000)/200)$

This leaves us with a necessary touch down speed of 157 knots.

Conclusion

Congratulation, you have just finalised your first sortie in the Northrop F-5E Tiger II. I hope you enjoyed the scenario and the tutorial was helpful. If you find a mistake or have some suggestions for improving the tutorial, any feedback is highly appreciated. I strongly recommend to repeat the mission several times to get a feeling for the procedures and flight characteristics. Have fun!

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