
DCS World Air to Ground Tutorial For the Mirage 2000C



Author:
Claus HOFFMANN
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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 and not available, while you are in the cockpit.

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 Mirage 2000C 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 Mirage. 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-M2000.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 Mirage 2000C 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 Mirage 2000C, that is provided as an DLC for DCS World by Razbam. 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. The Dassault Mirage 2000 is a French multirole, single-engine fourth-generation jet fighter manufactured by Dassault Aviation. It was designed in the late 1970s as a lightweight fighter to replace the Mirage III for the French Air Force. The Mirage 2000 evolved into a multirole aircraft with several variants developed, with sales to a number of nations.

The particular version presented in DCS World is primarily an interceptor and the secondary air to ground capabilities are quite limited. Dassault had a specific version for strike missions developed (Mirage 2000D), which is not modelled in DCS World. The Mirage features a unique “Fly-by-Wire” system, which gives it interesting flight characteristics. Flight performance is amazing and these two factors make the Mirage a fun model to fly.

1.5 The French Way

The Mirage has some unique features that are an example of the French way of doing things. However sometimes issues might as well be a bug by Razbam. Here are the main issues that I came across:

1.5.1 Weapons Delivery

The Mirage features two delivery modes for bombs being called “CCIP” and “CCRP”. But it is not quite what one would expect. CCIP is usually related to dive bombing attacks with normal bombs. You cannot do dive bombing attacks with for example MK82 in the Mirage, because in the so called “CCIP” mode you can only drop retarded bombs (i.e. MK82 Snake Eyes), which are supposed to be dropped in a low and fast pass. The so called “CCRP” mode on the other hand is not really CCRP, but is comparable to the CCIP “Consent to release” mode of the A-10C. In this mode the aircraft dives to the target to designate it and then pull up. The HUD symbology together with the sight computer will help to release the bombs on the designated target. This procedure is relatively safe but fairly inaccurate. Ordinary MK82 bombs can only be delivered in this mode. A real “CCRP” can only be done with laser guided bombs. Here you need an external laser designation as the Mirage cannot designate a target itself. To make things even more difficult, the computer system used for aiming can only handle a single kind of weapons on one sight. You cannot drop bombs and firing rockets on a target on the same mission. Some of these restrictions do not make sense at all in an airplane that is supposed to be acquired by many nations and therefore to be used in different threat scenarios.

1.5.2 Waypoint Coordinates

Geographic coordinates are usually expressed in degrees, minutes and seconds. If you use the mission editor to figure out a position on the map, the values given on screen are expressed that way. The coordinates in the Mirage INS require a percentage value instead of the seconds. So if you determine a waypoint in DCS in the mission editor or on map view, you need to do a recalculation to use the value for the Mirage INS. Fortunately the kneeboard in the Mirage gives you these values either in the proper format including the altitude in metres. As an example the Mirage in our situation is parked on the Senakhi airport on the coordinates:

- N 42 °14” 3’
- E 42 °2” 21’

The coordinates for the Mirage would be:

- 42:14.64 N
- 042:02.36 E

1.5.3 Autopilot

Common autopilots are designed in a way that turning on the autopilot does not change anything. One has to select a channel for the autopilot to actually control the aircraft like “Altitude Hold” or “Attitude Hold” to the advanced options in civil aviation like

“VNAV”. The autopilot in the Mirage is different. It has two modes, the basic mode is active, when the autopilot master switch is pushed. The aircraft is essentially in a attitude hold mode and the pilot can steer the aircraft via the trim switches. If the aircraft is levelled at invoking the master switch, the aircraft will follow the current heading. If in a turn the turn angle will be retained. This procedure is confusing at first encounter but quite intuitive and productive when used in flight. Soon after take off the autopilot should be invoked in basic mode and all flying should be directed via trim switches. Invoking the “Altitude Hold Button” keeps the aircraft on the current altitude, while invoking the “Selected Altitude Hold Button” will steer the aircraft to the altitude selected in the “Altitude Selector Drum”. In any mode the throttle is not managed and it is up to the pilot to monitor speed and operate the throttle as required.

1.5.4 HSI

Unlike standard HSI used in American aircrafts, the Mirage HSI was designed to require little to no pilot input. It consists of a compass rose to indicate aircraft true or magnetic heading, a selected auto pilot heading indicator, two needles, a four-digit mechanical display, an operational mode indicator and four failure flags. The only input required is the operational mode to be selected via the HSI mode selector. Choosing a radial for navigation purposes, as is the norm in any other aircraft, is not possible.

1.6 The Mission

The Mission description is as follows:

Your country only lately gained independence. It 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 built 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 Dassault Mirage 2000C 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 Dassault Mirage 2000C. 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 Mirage is armed and fuelled and ready to y. 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 Mirage

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

1.6.1 The Targets

Two ammunition stores are located on the southern end of the airfield. The M2000C cannot carry heavy bombs. Therefore the stores are not bunkers but normal buildings.

On the northern part of the airfield three fuel tanks have been installed. This is what the target area looks like:

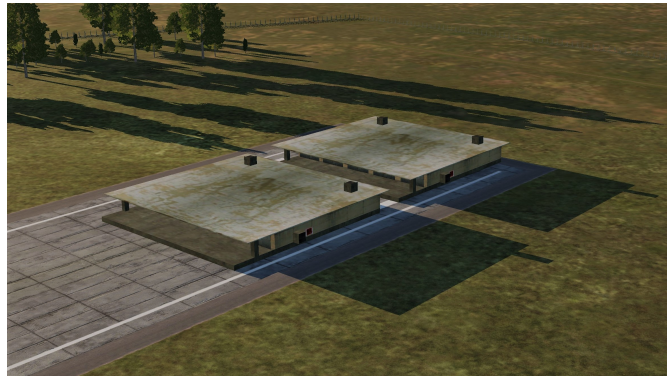


Figure 1.3: The two ammunition stores



Figure 1.4: The three fuel tanks

1.6.2 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:

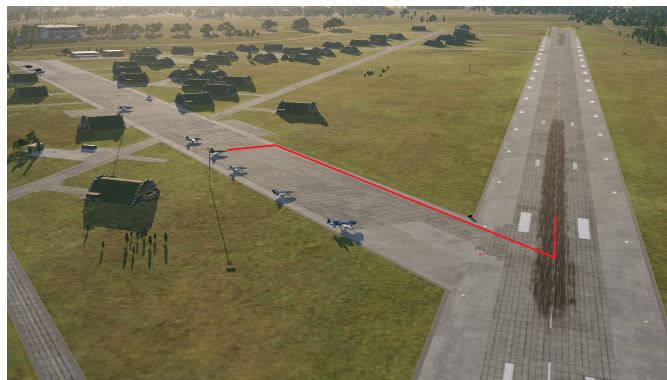


Figure 2.1: Location on ramp

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

2.2 Startup

2.2.1 Cockpit Preparation

- Power Supply

To avoid draining the battery too much during running up of systems and engine, it is recommended to require ground power. Call ground crew for power supply:
\, F8, F2, F1

Then turn on the battery (“M”), Make sure that the alternator and the two inverter switches next to the battery switch are On (“M”) as well. Usually this is already the case.



Figure 2.2: Turn on Battery

- INS Alignment

The INS system is old school and somewhat tedious to use. It consists of two interfaces in the cockpit:

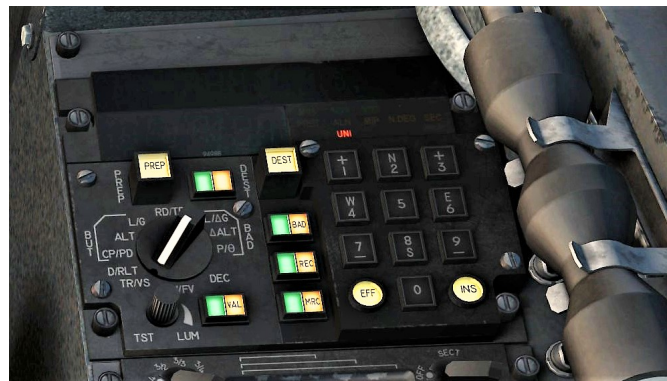


Figure 2.3: INS PCN



Figure 2.4: INS PSM

To start the alignment process, we need to do the following:

- PSM Operational knob to N
- PSM Mode Knob to VEI
- Data Selection Knob on PCN to “L/G”



Figure 2.5: INS PCN

- The aircraft does not know, where it is. We have to input the precise coordinates ourself. For that we have to know our coordinates preferably in the notation used by the M2000C. Fortunately this can be achieved by using the kneeboard (RShift-K). On page 3 the coordinates of your airplane are outlined in the proper format. Inputting the coordinates into the INS is mainly done with the numerical keyboard on the PCN:

Button **1** to choose the left window

Button **2** to choose North

Input 421464 on the keyboard and finish with the button “INS” for insert

Button **3** to choose the right window

Button **6** to choose East

Input 0420236 on the keyboard and finish with the button “INS” for insert



Figure 2.6: INS with the new coordinates

- For inserting the altitude of the aircraft at its current position:
Turn Data Selection Knob on the PCN to “ALT”
As we have the altitude information in metres we choose the right window by pressing the knob **3**
The aircraft is above sea level, so we need positive values. We need to press the knob **1** again.
We are 15 metres above sea level. Therefore we insert 00015 on the numerical keyboard and press “INS”



Figure 2.7: INS with altitude input

- On the PCN we press the button “VAL”
- We turn the Mode Knob on the PSM to “ALN” to start the initialisation process
- We turn the Operational Mode Knob to “STS” to see the advance of the alignment process on the PCN

The INS needs 8 minutes to align. That is the reason we start the process at the very beginning.

- External Lighting

- Anti-Collision Lights to “FAIB”
- Navigation Lights to “FAIB”
- Formation Lights to “FAIB”

- Radios

The Mirage is equipped with two radios. For this mission we only need to communicate with the ATC from Senaki-Kolkhi, which uses the UHF frequency 132.00. To prepare for transmitting we do the following:

- Turn on both radios by turning the switches to “M”. We will only use V/UHF COM1 radio (the lower one)
- Turn the V/UHF RX Mode Selector to “PAL+G”
- Use the drums on the V/UHF radio to dial in the frequency 132.00. The frequency can be verified on the COM frequency display on the upper left front dash.

- HUD (VTH) and Radar Control Panel (VTB)

- VTH power switch to middle position “M”
- Radar altimeter switch to “M”
- VTH mode switch to “H”
- VTB display power switch to “M”

- Countermeasures

Three countermeasure types are installed in the Mirage. It is flares, chaff and ECM jammer. Implementation of these systems is poor in the Razbam Mirage.

- Radar IFF power switch to CONT
- Countermeasure power switch to AUTO
- ECM mode selector to SQUARE (which is the normal mode)
- BR (Jammer), D.A. (RWR status) and D.2M (Missile launch detector) to “M”
- Decoy dispenser to AU (automatic)
- Decoy program selector to any number, as programs are not implemented

- Radio Navigation

We prepare the TACAN and ILS systems just for emergency. They will not be used in the normal course of this tutorial.

- Select frequency X31 on the TACAN interface

- Turn right TACAN button to “TR”
 - Select frequency 108.9 on the ILS
 - Set VOR/ILS on “M” with the left dial
- Miscellaneous
 - Emergency Hydraulic pump switch forward
 - Secondary ADI/HSI switch forward
 - Uncage standby ADI
 - Cockpit lights as required
 - Canopy closed
 - Apply parking brake

The cockpit preparation is finished now and we can start the engine.

2.2.2 Engine Startup

For the start of the engine we need the engine start panel:



Figure 2.8: Initial Engine Start Panel



Figure 2.9: Engine Start Panel Ready for Start

- Request approval for engine start: \, F5, F1, F3
- Starter fuel pump to on
- Engine start cover open
- Ignition/Ventilation selector switch to either “G” or “D”
- Fuel shutoff valve close
- Right fuel pump to “M”
- Left fuel pump to “M”
- Press engine start button
- Engine RPM at 10% advance throttle to IDLE (Most joysticks do not have an idle position, so just move the throttle forward a bit and pull it back again to invoke the idle position)
- When engine RPM stabilize close engine start cover and shut off the starter fuel pump
- Remove ground power: \, F8, F2, F2

2.2.3 System Startup

- Radar Warm Up
- Autopilot Test

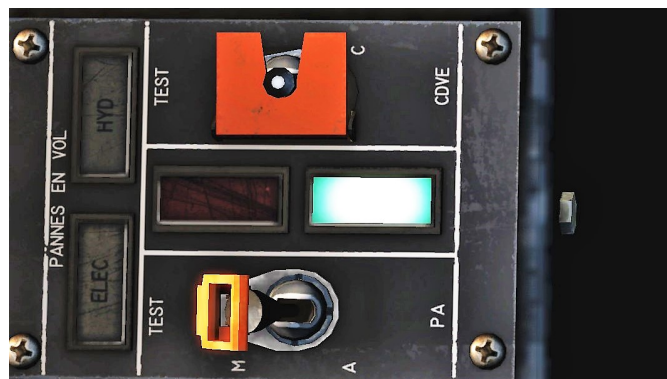


Figure 2.10: Autopilot Test

- FBW Test



Figure 2.11: FBW Test

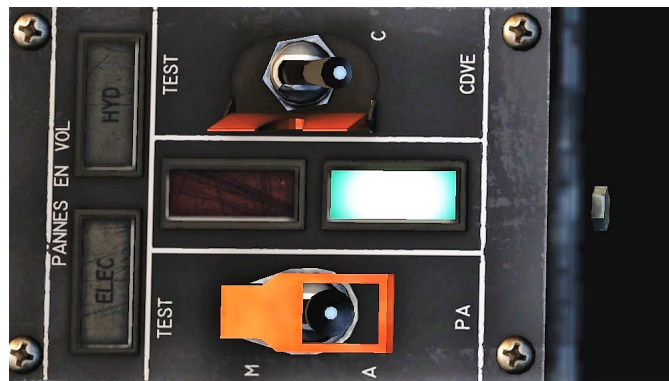


Figure 2.12: FBW Test

- HSI Mode Selection



Figure 2.13: HSI Mode Selection

- Pitot Heat on
- Steering on
- Landing Lights on
- Parking Brakes release

2.3 Taxi and Take Off

- ATC Taxi Clearance: \, F5, F1
- Taxi to runway threshold



Figure 2.14: Last Stop at Runway Threshold

- ATC clearance for take off: \, F1
- Align aircraft on runway



Figure 2.15: Aircraft Aligned on Runway

- Tune altimeter to air pressure provided by ATC (Please note that ATC is providing air pressure expressed in inHg, while the Mirage uses millibars. You have to recalculate yourself. Fortunately Senaki is, as we already learned by adjusting the INS just 15 meres above sea level. So it is easy to adjust the altimeter without recalculation)
- Turn off Front Wheel Steering
- Increase throttle to 100% with wheel brakes applied
- If engine works normal release wheel brakes and apply full throttle
- At 130 knots raise nose to 15% and wait until aircraft exhibits a positive rate of climb



Figure 2.16: Rotation

- Gear Up
- At 300 knots reduce power to turn off afterburner

- When flight path is stabilized turn on autopilot in basic mode

2.4 Enroute Flight

The Mirage is now in a stable climb flying east. Make sure not to climb higher than 5.000 ft., as we do a low level attack on a target not too far away. To accomplish our mission we want to fly the following profile:

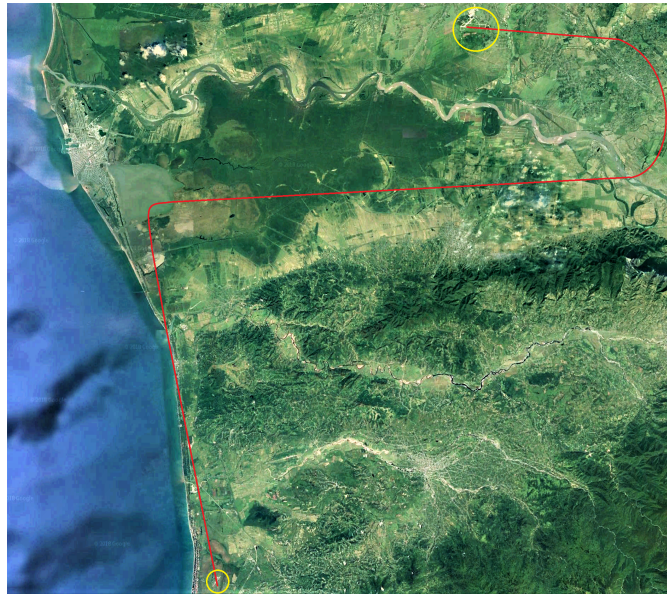


Figure 2.17: Flight Profile

The flight plan require us to turn to the right roughly 180° to follow a course of approximately 270°. Reaching the Paliastomi lake near the city of Poti, we turn to the left following a path of roughly 173°. This flight profile brings us more or less on a path along the runway of the target area. As soon as we acquire visual contact we reduce altitude to under 1.000 ft.

3 Weapons Delivery

3.1 General Tactical Considerations

Our targets are two ammunition stores and three fuel tanks that are located very closely to each other. The bombs, the Mirage is able to deliver are not capable of penetrating a bunker (no MK84 available). Therefore in this training mission the targets are just stores and not bunkers, as in my other tutorials. The so called “CCRP” mode is not precise enough, so I decided to use MK82 Snake Eye bombs in a fast and low approach on the target. To avoid overflying the target area too often, we attack the bunkers with a “Carpet Bombing” approach. We fly along the deserted runway and drop all 8 bombs on the two stores in one go using an interval of 02 on the PPA. As the weapons delivery computer of the Mirage cannot handle different air to ground stores in one flight, we will attack the fuel tanks with cannons, instead of the more appropriate unguided rockets, used in other air planes. The weapon usage is as follows:

- On the first run, we use 8 MK82 Snake Eye bombs to attack both stores in one run using an interval of 02 on the PPA
- On the second run, we use our cannons to attack the fuel tanks

As the distance to the target is usually much longer, you would need external fuel, so that the weapons load would be restricted. As our enroute flight to the target area is very short, in this mission the internal fuel is sufficient. No external fuel is required or loaded.

3.2 Bomb Delivery with the Mirage

3.2.1 Preparation for the Bombing Run

On the approach to the target we set up the PPA for our attack:



Figure 3.1: PPA Settings First Run

- Bomb Fusing Selector to “RET”. this position arms the bombs tail fuse thus allowing them to penetrate the target before exploding.
- The Bomb Release Quantity Selector is used to set the Selected Quantity Display to 08 to unload all bombs on one pass.
- The Bomb Release Interval selector is used to set the Selected Interval Display to 02, which is supposed to be 20m. In my experience the interval is much higher.
- Turn the Master Arm Switch on the PCA to up (ON).
- On the PCA press the button “BFI” to choose the bombs as active weapons



Figure 3.2: Select Bombs from PCA

- Increase seating height as much as possible to be able to see the release circle on the HUD.

3.2.2 Approach on Targets

To be able to attack the two stores in one attack run it is necessary to approach the target area along the abandoned runway the stores are constructed upon. This runway lies close to the coast and has a bearing of 173° . To attack from this angle we turn to the coast directly after take off. When reaching the coast line we turn left and align the aircraft with the runway as soon as we acquire a visual on the target.



Figure 3.3: Aircraft Aligned to Targets

The flight profile should be chosen to overfly the target at an altitude of between 500 feet and 1.000 feet (the lower, the better). The target computation requires that the aircraft speed is below 0.83 Mach. Therefore a speed of 0.82 Mach is the optimum.

3.2.3 The Attack

For a successful attack we now fly on a course of 173° along the runway at an altitude of less than 1.000 feet and higher than 500 feet at a speed of 0.82. As soon as the release cue on the HUD reaches the first store we press the pickle button to release the bombs. The pickle needs to be pressed long enough that all eight bombs of this single bomb run are released.



Figure 3.4: HUD View at Release



Figure 3.5: Mirage at Release



Figure 3.6: Target Hit

3.2.4 Second Run

After dropping the bombs on the ammunition stores we exit the target area flying low to the south. While entering the mountainous area south of the target area we turn left to go back to the target area. Now we attack the tanks from an eastern direction to have the three tanks in a row behind each other for better aiming.

For preparing the aircraft for the second run we need to prepare the cannons for a ground attack. Push up the gun arming switch and press the low left button on the PCA for air to ground gun mode. Align pipper on target at a dive level of about 20° to 25°. Press weapon release button when in range and try to avoid flying through the explosion to not damage your aircraft.



Figure 3.7: Gun Air to Ground Preparation



Figure 3.8: Gun Piper on Target



Figure 3.9: Hit on the Tanks



Figure 3.10: Escape Explosion

3.3 Exit the Target Area

In case everything went according to plan you are now flying low and fast roughly in a western direction out to the open sea. Start climbing after the beach has been crossed. Over the sea turn north along the coast line and climb to 4.000 feet.



Figure 3.11: Exit the Target Area

- Autopilot to Standby Mode
- Turn the Master Arm Switch on the PCA to down (OFF).
- Anti-Collision Lights to “FAIB”
- Navigation Lights to “FAIB”
- Formation Lights to “FAIB”
- Radar Power Switch to “A”

4 Return and Landing

4.1 Return

After delivering the weapons payload and hopefully hitting the targets, it is time to return to base. For our return, we climb back to 4000 feet at a speed of approximately 400 knots and follow the coastline northward.

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. The needle of the HSI shows us the bearing to the TACAN and in the number field of the HSI we see the distance to the airfield. As soon as the TACAN needle on the HSI approaches 88°, we turn right to start our approach.



Figure 4.1: Turn into the Approach

4.2 Landing

We now come to the final part of the flight that is fortunately relatively easy in the Mirage compared to some older aircraft, especially the MIG 21bis, which is a real challenge to land.

- On the PCA we select “APP” to turn on the approach mode on the HUD.
- Contacting tower to inform on our approach: \, F5, F1

- We start our descent and align the aircraft to the runway in front of us by lining up the flight path marker on the point on the runway we want to touch down.
- Deploy landing gear below 230 knots.
- By adjusting throttle and stick line up acceleration chevrons together with flight path marker within the glide slope brackets.



Figure 4.2: Approach in HUD View

- Aim for touch down for a speed well below 200 knots.
- After touch down keep the nose up for aero braking until the Mirage slowed down under 100 knots.



Figure 4.3: Aero Braking

- After touch down of the nose wheel use wheel brakes to slow down.
- Turn on nose wheel steering when speed is well below 50 knots.
- Leave runway at the earliest possible exit and come to a complete stop.

4.3 Conclusion

Congratulation, you have just finalised your first sortie in the Dassault Mirage 2000C. 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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