

DIGITAL COMBAT SIMULATOR

MiG-15

Flaming Cliffs



Quick Start Guide



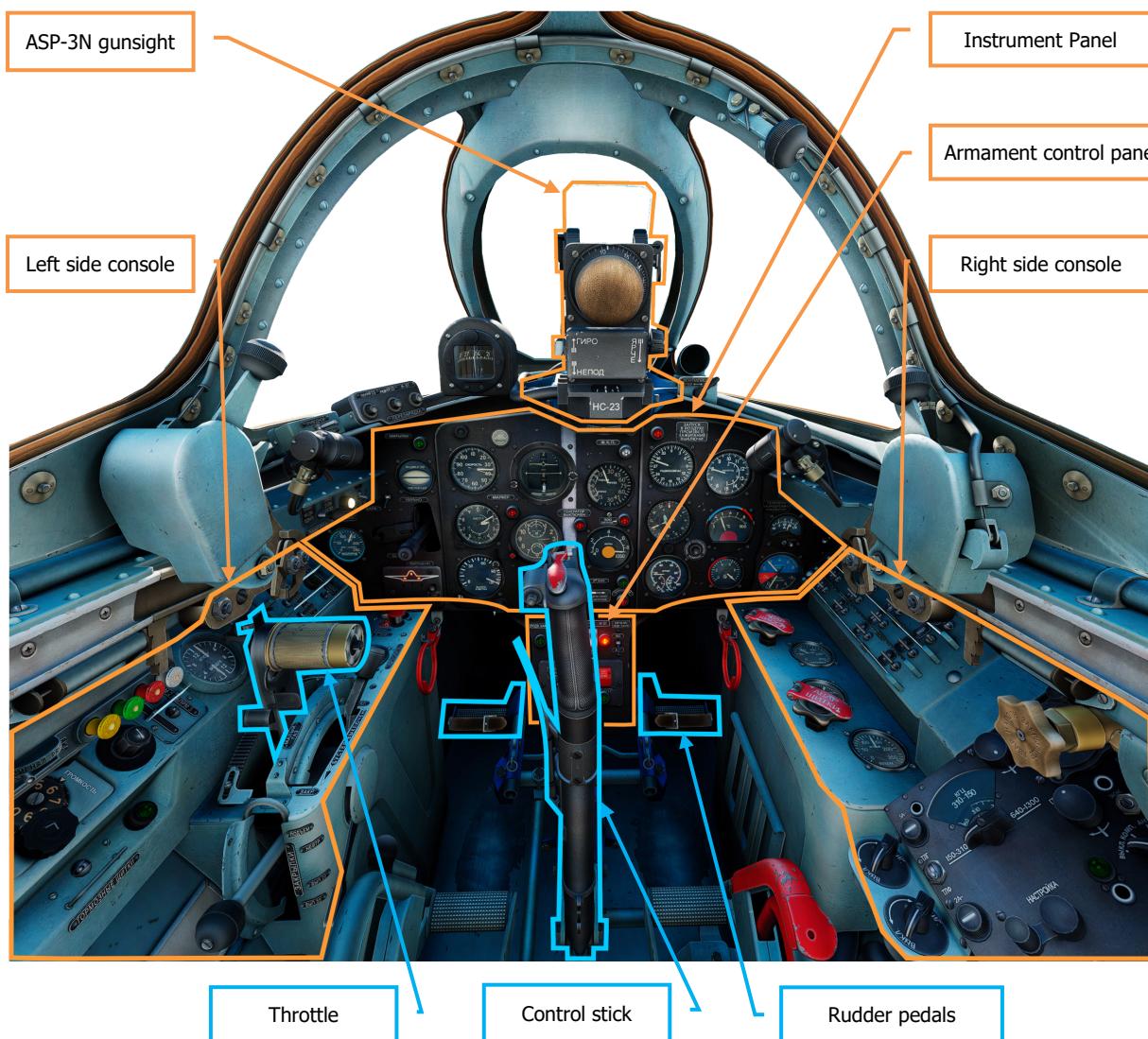
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COCKPIT

The cockpit of the MiG-15bis has a standard arrangement. The flight controls are conventional, with a centrally mounted control stick, left-handed throttle handle, and foot-operated rudder pedals. The forward cockpit is dominated by the instrument panel and the ASP-3N gunsight positioned above it. The side panels house various aircraft system controls and indicators.



Flight control stick

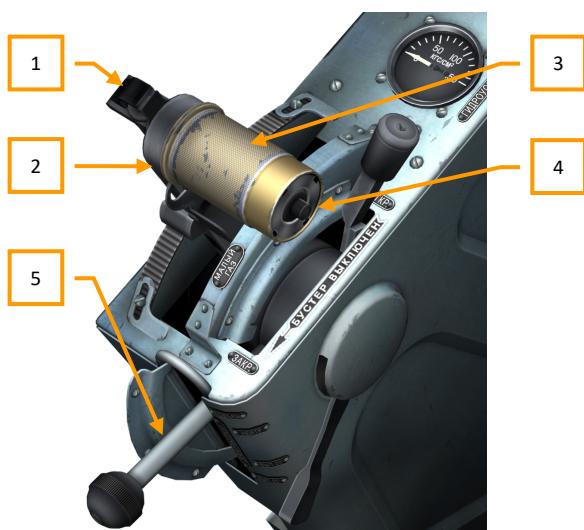
Flight control stick has a number of buttons and levers to control other systems and equipment.



1. N-37D gun firing button with a safety cover **Space**
2. NR-23 gun firing button **Space**
(when selected by pressing **L.Ctrl+Space**).
3. Speed brake extension button **B**.
4. Bomb and fuel tank jettison button **R.Alt+Space**.
5. Brake control lever **W**.

Engine throttle handle

The engine throttle handle is located on the left control pedestal. It controls the thrust of the VK-1 jet engine.



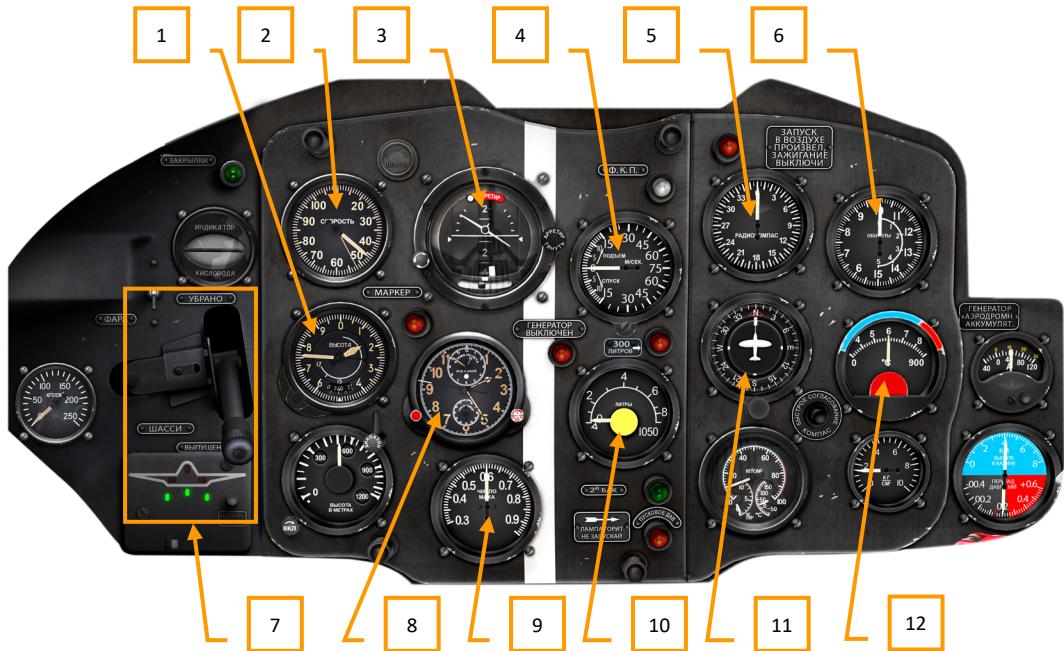
1. Safety cover for the engine starter button.
2. Throttle.
3. ASP-3N gunsight target range twist.
4. Radiotransmitter button.
5. Flaps extension/retraction lever **F**.

Rudder pedals

The pedals are used in flight to yaw the airplane left and right using the rudder and, on the ground, to turn the nose wheel when taxiing.

Instrument panel

The instrument panel contains various instruments and indicators:



1. Altimeter;
2. Airspeed Indicator;
3. Attitude Indicator;
4. Vertical Velocity Indicator;
5. Radio Compass Indicator;
6. Engine RPM Indicator;

7. Landing Gear Control Handle;
8. Clock;
9. Mach Number Indicator (M) ;
10. Fuel Quantity Indicator;
11. Gyromagnetic Compass Indicator;
12. Exhaust Gas Temperature Gauge.

1. Altimeter displays barometric (pressure) altitude in meters (m). The short needle points to thousands of meters and the long needle points to hundreds of meters. In this example, the altitude shown is 1,760 m. Because the altimeter reads air pressure altitude, it does not indicate altitude above actual terrain beneath the aircraft.	
2. Airspeed Indicator shows airspeed in kilometers per hour (km/h). The large arrow displays indicated airspeed (IAS), which depends on the air density, while the small needle displays true airspeed (TAS), relative to the air mass. In this example, the indicator shows 460 km/h IAS and 520 km/h TAS.	
3. Attitude Indicator shows the aircraft's pitch and roll position relative to the horizon. A turn indicator along the bottom of the pitch scale to display turn rate and direction. The indicator also includes a slip ball inside a glass tube to display sideslip. The pitch scale is marked with the numbers "2", "4", "6", "8" and the scale graduation value is 10°. The roll scale graduation value is 10°. In this example, the aircraft symbol indicates 8° of nose up pitch and 20° of right roll, the aircraft is turning right without sideslip.	
4. Vertical Velocity Indicator shows rate of climb/descent in meters per second (m/s). This indicator is especially useful to help maintain level flight and best descent and climb rates. In this example, the indicator shows a climb rate of 3 m/s.	
5. Radio Compass Indicator is an element of the ARK-5 automatic direction finder. When the ARK-5 mode selector switch is in the КОМПАС (COMPASS) position, the needle of the Radio Compass Indicator points to the radio beacon.	

6.	<p>Engine RPM Indicator displays engine compressor revolutions per minute (RPM) and is the main gauge of engine power output. The inside scale displays 0 - 5,000 RPM (used when starting the engine and at low power settings) while the outside scale displays 5,000 - 15,000 RPM.</p>	
7.	<p>Landing Gear Control Handle is used to retract and extend the landing gear. This can be done either by pressing G. The landing gear status indicators display the state of the main and nose gears: three green for extended and locked or three red for retracted and locked.</p>	
8.	<p>Clock displays the current time of day in hours, minutes, and seconds</p>	
9.	<p>Mach Number Indicator (M) displays the Mach number which is the relation of the true airspeed to the speed of sound.</p>	

10. Fuel Quantity Indicator displays the amount of fuel remaining onboard in liters. A red warning light positioned above and to the right of the indicator, marked 300 ЛИТРОВ , turns on when 300 liters remain.	
11. Gyromagnetic Compass Indicator shows current aircraft heading relative to the North in the range from 0 to 360 degrees. One division on the scale equals 2°.	
12. Exhaust Gas Temperature (EGT) Gauge measures the temperature of exhaust gas behind the turbine. The gauge is able to sense temperatures from 0 to 900°C. One division on the scale equals 20°C	

CONTROLS

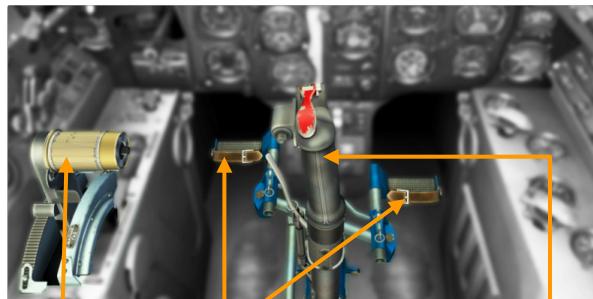
Joystick controls

Primary aircraft flight controls include the Control Stick, Throttle, and Rudder Pedals. The control stick is used to roll the aircraft left and right to perform turns, and pitch the nose up and down to climb or descend. The throttle is used to control the engine power and airspeed. The pedals are used in flight for yaw control (turning the nose of the aircraft to the left or right) and slip compensation using the rudder. They are also used on the ground to turn the nose wheel when taxiing.

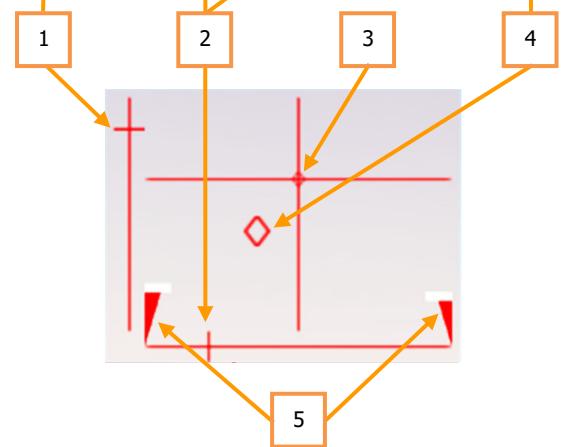


If you have a joystick, it may be equipped with a throttle handle and/or a twist grip (allowing you to control the pedals).

When flying from the cockpit, you can toggle the Controls Indicator display by pressing **R.Ctrl+Enter**.



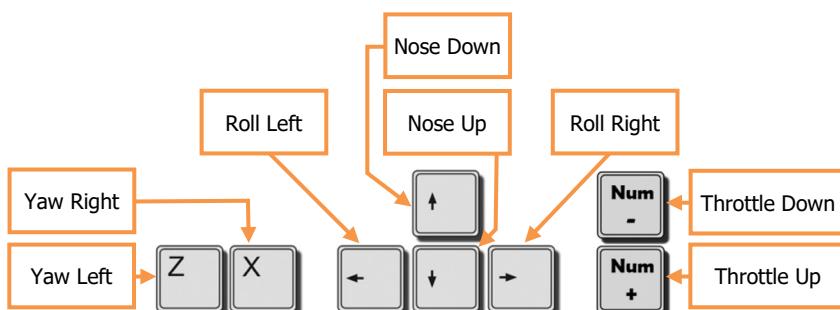
1. Throttle and Position Indicator.
2. Rudder Pedals and Rudder Control Position Indicator.
3. Trim Tab Position.
4. Control Stick and Position Indicator.
5. Right and Left Wheel Brake Position Indicator.



Keyboard controls

If you are flying with only a keyboard, the primary flight control keys will be:

Arrow keys – to control pitch and roll,
Numpad+ and **Numpad-** – to control throttle,
Z and **X** – to control rudder pedals.

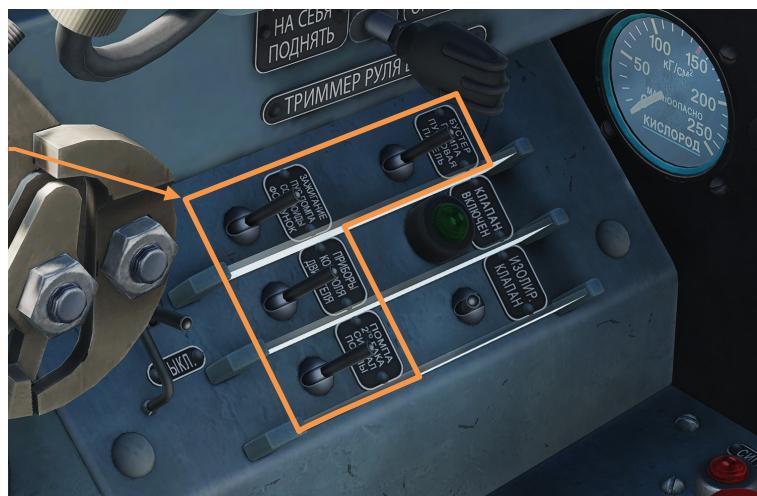


PROCEDURES

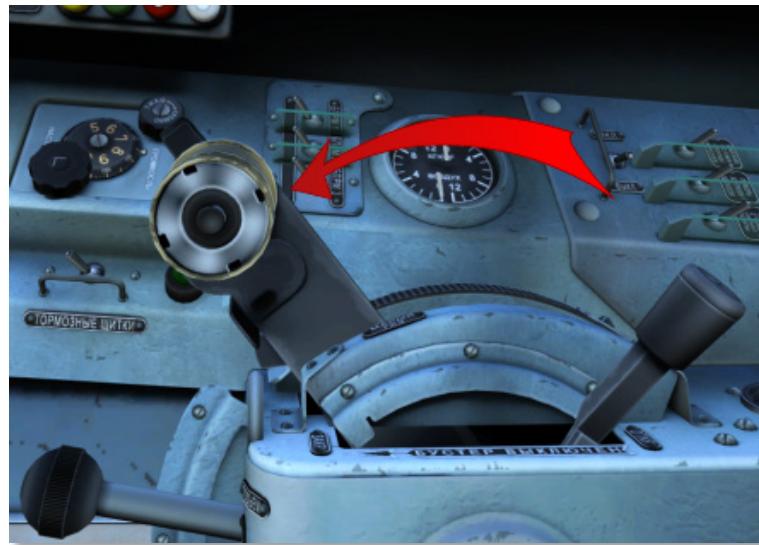
Engine start

To start the engines when on the ground, perform the following steps:

1. Turn on the power supply and main automatic circuit breakers (ACBs) on right and left electrical panels by pressing **R.Shift+L**.



2. Set throttle full back (idle) **Numpad-.**



3. Press **R.Shift+Home** to start the engine. Verify idle RPM – 2400-2600, exhaust gas temperature (EGT) – 510°C maximum.



4. Close the canopy **L.Ctrl+C**.

Taxi

To start taxiing perform the following steps:

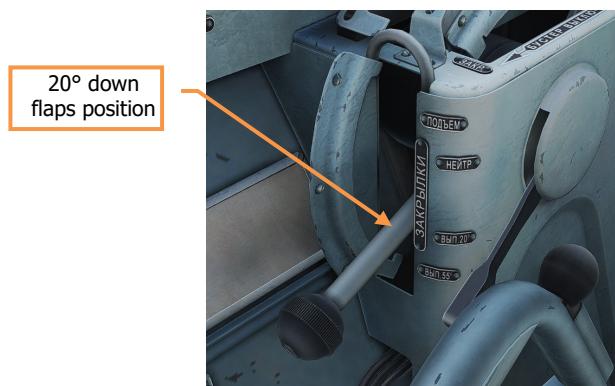
1. Gently control the throttle by pressing **Numpad+** or **Numpad-**. Increase engine power to approximately 6000 RPM to start rolling.
2. Test main wheel brakes by pressing **W**.
3. To turn while taxiing on the ground, use separate wheel braking. Apply rudder pedal input in the desired direction of turn **Z** or **X** while **simultaneously** applying the wheel brakes **W**. For example to turn right, press and hold **X** to apply right pedal while pressing **W** to apply the wheel brakes. The right wheel will be braked, but the left wheel will not, and the airplane will turn right. If necessary, increase engine RPM.

While taxiing, set the engine RPM to the level which provides safe taxiing speed (preventing roll-overs during turns, collisions and rolling off the runway).

Takeoff

Perform the following steps for takeoff:

1. Enter the runway. Roll forward slightly to align the aircraft with the centerline (do not try to align airplane on the centerline precisely, any alignment parallel to the centerline is good enough).
2. Press **L.Shift + F** once to lower the flaps to the 20° takeoff setting.

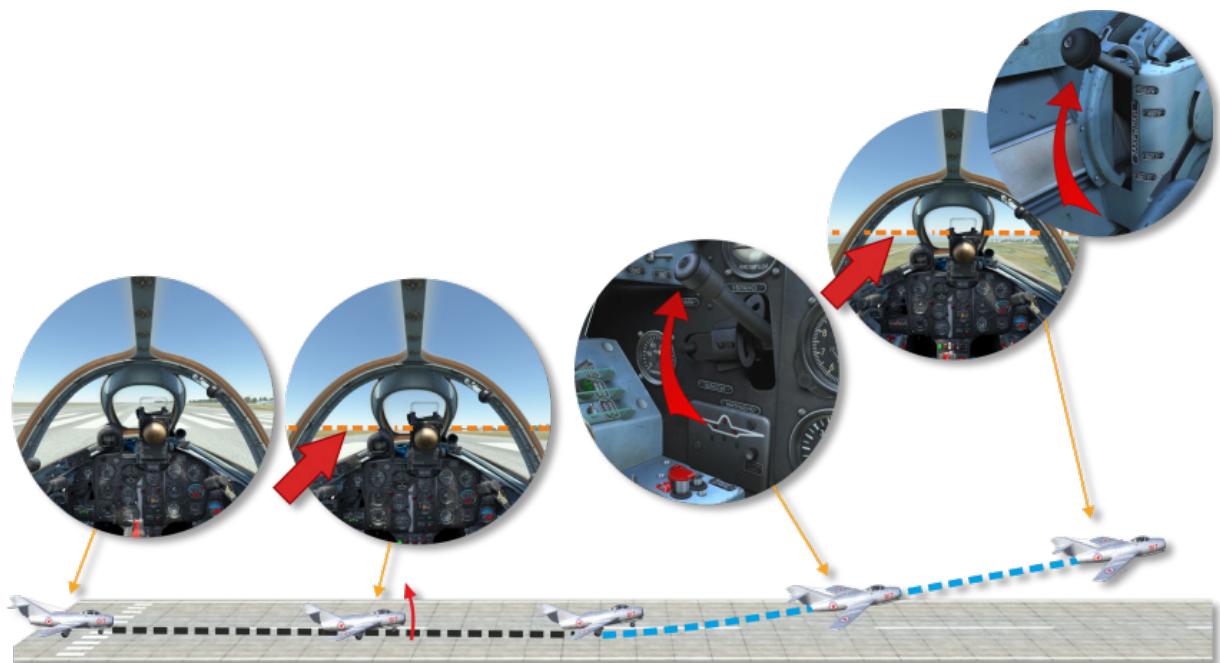


3. Increase engine revolutions to 8000-9000 RPM **Numpad+**, release brakes **W**. Start takeoff run and increase RPM to maximum (takeoff value).
4. During the initial roll use separate wheel braking to maintain direction. Apply rudder pedal input **Z** or **X** while simultaneously applying the wheel brakes **W**. When the speed reaches **50-80 km/h**, the rudder becomes effective and you can maintain the direction with pedals only.
5. When reaching **150 km/h**, gently pull back on the control stick (by joystick or by pressing **↓**) to lift the nose of the aircraft. When the nose of the airplane starts to move upwards, reduce (smoothly) the pitch to prevent pulling the nose too high, tail touching the runway and the airplane stalling after liftoff. For a safe takeoff, the horizon line should be just above the bottom of the forward canopy windshield.



6. At **220-230 km/h** the aircraft will smoothly lift off. Once safely off the ground and climbing, retract the landing gear **G**.

7. Press **L.Ctrl+F** once to set the flaps to UP (ПОДЪЕМ).
8. Maintain the climb rate so that the airspeed increases and the aircraft gains altitude. Set the required flight mode.

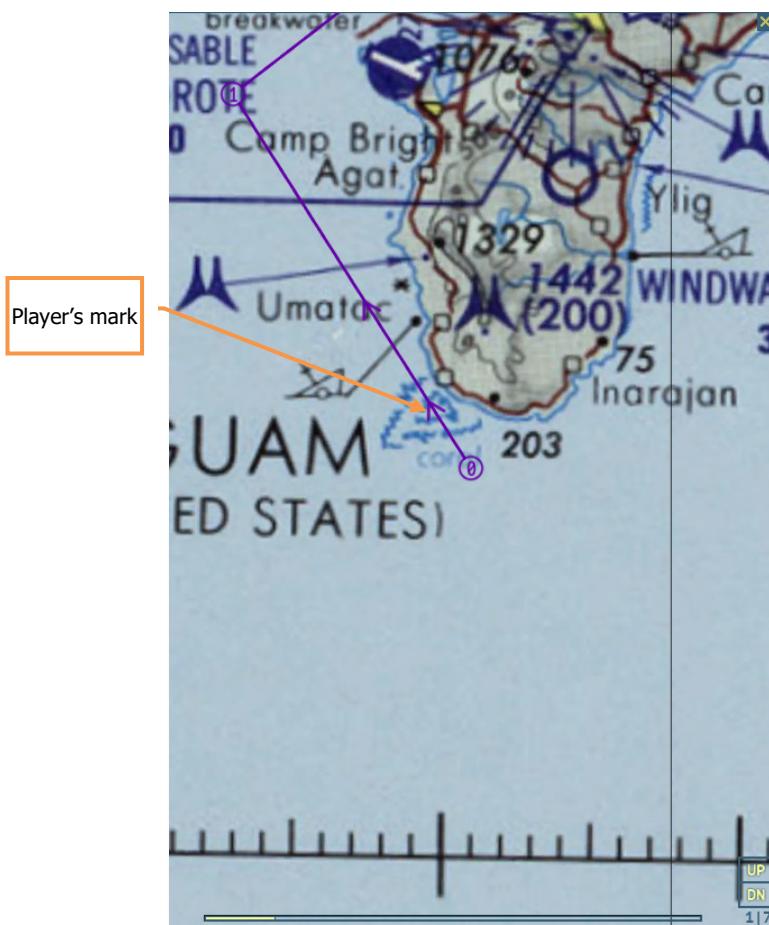


Navigation

You can use the kneeboard (**R.Shift+K**) for in-flight navigation.

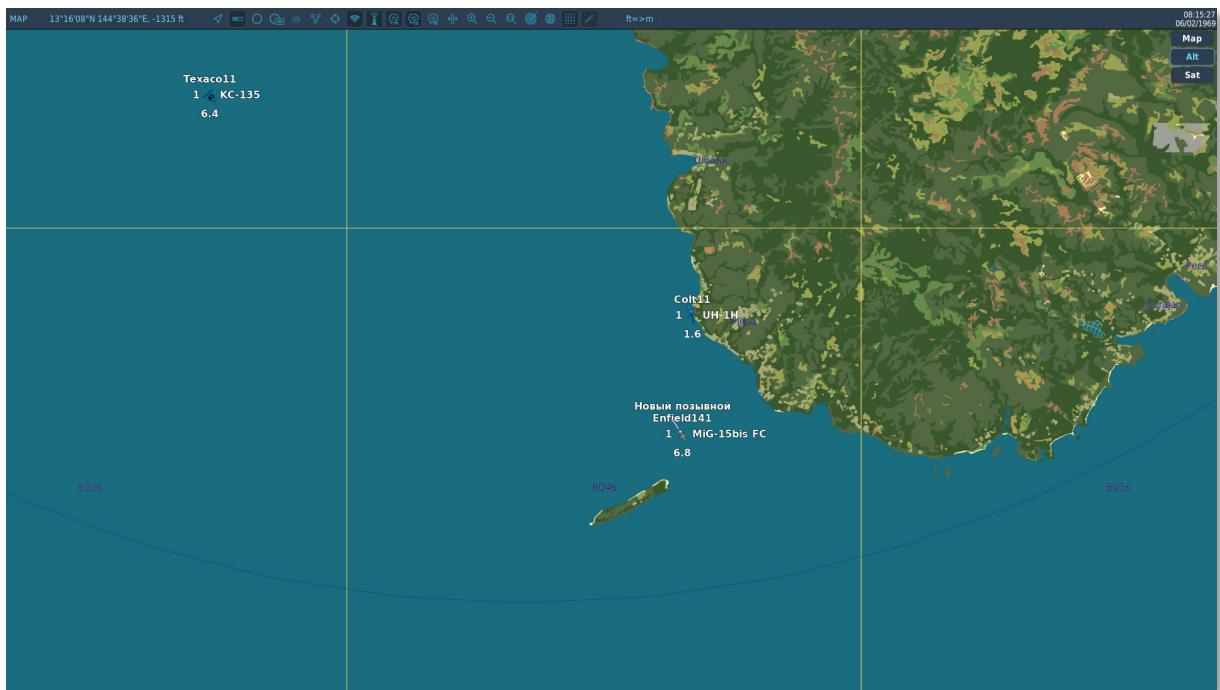
Flip pages with **I** and **J** buttons to see the required area of the map.

Press **R.Ctrl+K** to mark your current position.



You can also access the full-screen theater map view by pressing **F10**. It has a toolbar which can be used for orientation.





Emergency procedures

Compressor stall

Compressor stall signs include (one or several issues may manifest simultaneously): engine RPM hang (reduction), RPM unresponsiveness to throttle, engine overheat.

In this case, set the throttle to idle **Numpad-**, until the normal temperature and RPM values are reached (or until stable RPM reduction towards idle values). Then, smoothly adjust the throttle as necessary.

Airstart

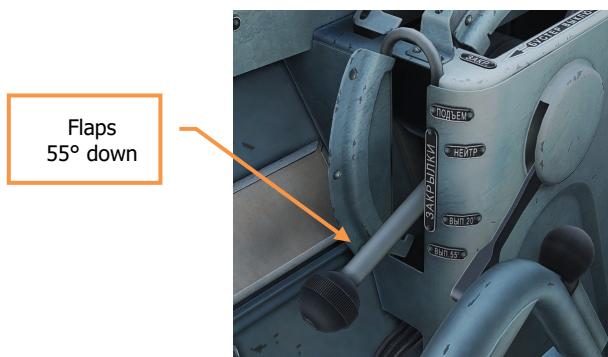
In case of engine shutdown in flight, if time and altitude allow, it is possible to perform an airstart:

1. Set the engine throttle to idle **Numpad-**.
2. Adjust the airspeed to 300-320 km/h.
3. Press **R.Shift+Home** to start the engine.
4. Verify IDLE, RPM value should be between 2400-2600.
5. Slowly adjust the throttle as necessary by pressing **Numpad+** and continue the flight.

Landing

Perform the following steps before landing:

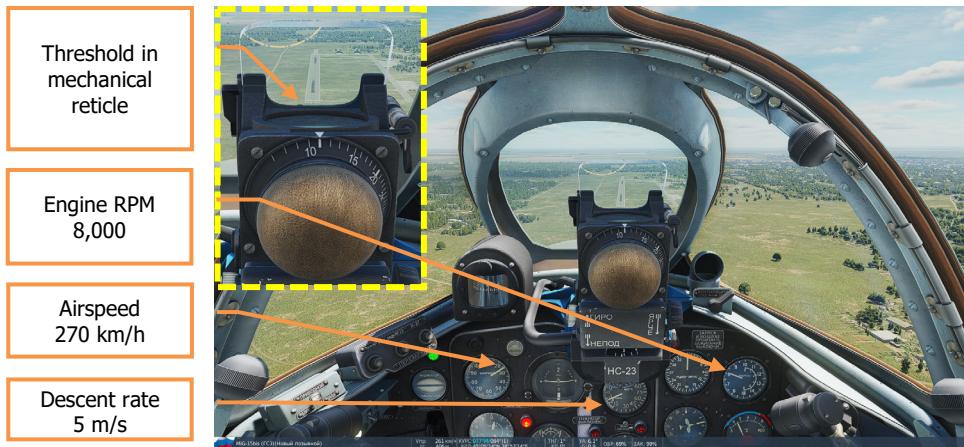
1. Before entering final approach, decrease engine power **Numpad-** to reduce airspeed to approximately **450 – 400** km/h. If necessary, use speed brakes **B**.
2. Press **G** to extend the landing gear. While flying without descending, retract airbrakes **B** and increase engine RPM to avoid speed loss.
3. Continue to reduce airspeed to **320 - 350** km/h. Press **L.Shift+F** once to set flaps to **20°** (required to unlock the actuators), then, after at least 1 second, press **L.Shift+F** again to set flaps to the landing position of **55°**.



4. Final approach speed is **250 - 270** km/h. Engine power on final approach is approximately **7000 - 9000** RPM.

Note: Avoid reducing engine power below 6000 RPM due to poor throttle response, possible loss of speed and stall.

On final approach, the stowed mechanical reticle of the gunsight can act as a helpful reference by placing it over the runway threshold. In other words, "aim" for the touchdown point by placing the threshold along the bottom of the gunsight glass.



Airspeed below 200 km/h may lead to a stall, loss of control, and crash.

5. Start leveling the airplane (reducing descent rate) at an altitude of 7-10 m by smoothly pulling back on the stick **[J]**. Reduce engine power to idle **Numpad-**.
6. Flaring (precedes touchdown) performs at altitude of 1 m. If it is performed in compliance with the conditions described above, speed gradually decreases to 210-200 km/h.
7. Touchdown of the main landing gears should be very soft within speed range of 200-190 km/h.
8. After touchdown use pedals (rudder) to maintain desired direction (**Z** or **X**), and when speed decreases to 50 km/h use separated wheel breaking by pressing **Z** or **X** and **W** simultaneously. Apply brakes by short presses of **W**.
9. Before exiting the runway, raise the flaps by pressing **L.Ctrl+F** twice. Press **B** to retract the speed brakes if necessary.

Engine shutdown

Set throttle to idle **Numpad-** then shut down the engine by pressing **R.Shift+End**.

Once the engine spool down, switch off all of the ACBs on the left and right electrical panels **R.Shift+L**.

WEAPON EMPLOYMENT

Guns are the primary weapons of the MiG-15bis, however, the aircraft is also capable of carrying bombs.

Guns:

- 2 x 23 mm NR-23 guns with 80 rounds per gun;
- 1 x 37 mm N-37D gun with 40 rounds.

Bombs:

- 2 x 100 kg or 50 kg bombs on underwing hardpoints.



ASP-3N Gunsight

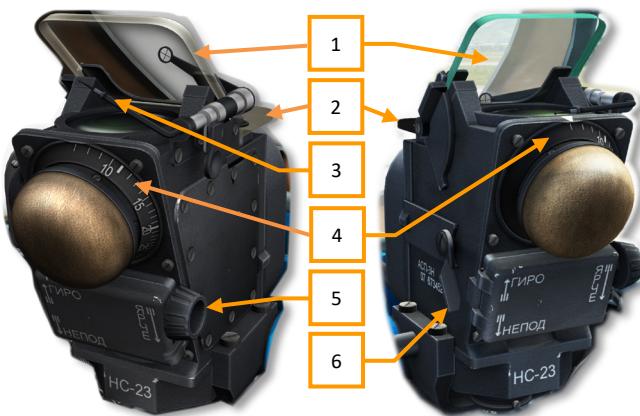
Gun aiming is accomplished using the automatic gyro ASP-3N gunsight.

The gunsight head with the target size (wingspan) dial (1 and 2) is installed above the instrument panel before the armored windshield.

The ASP-ZN sight provides the lead angle when firing at a range from 180 m to 800 m at targets regardless of their speed and shooting angle. The time of flight of the round, required for building the lead angle, is entered by adjusting the a target range using the throttle twist grip (3 и 4).

Because the gyro system suffers calculation errors under heavy maneuvering, the sight can be set to fixed (caged) reticle mode. Alternatively, you can use the standby mechanical reticle.

The gunsight must be caged during takeoff, landing or heavy maneuvering to avoid damaging the gyro mechanisms.



- | | |
|--------------------------------|--|
| 1. Reflector glass; | 5. Reticle brightness knob; |
| 2. Sun filter glass; | 6. Caging lever (down for caged mode, up for gyro mode). |
| 3. Standby mechanical reticle; | |
| 4. Target wingspan dial; | |

Gunsight operational modes

ASP-3N gunsight has four operational modes:

- “NAVIGATION” mode is selected by pressing 1 (default mode). In this mode, the gunsight and armament are disabled.
- “AIR-TO-AIR” mode is selected by pressing 6. It is designed for air-to-air combat.
- “AIR-TO-GROUND” mode is selected by pressing 7. It is designed for air-to-ground attacks.
- “MECHANICAL RETICLE” mode is selected by pressing 8. Activates mechanical sight reticle in “AIR-TO-AIR” and “AIR-TO-GROUND” modes. The mechanical reticle is also a backup aiming tool in case of failure or damage to the main gunsight.

Armament Control Panel

The armament control panel is located below the instrument panel. This panel includes a number of important indicators and controls for configuring weapons for fire.



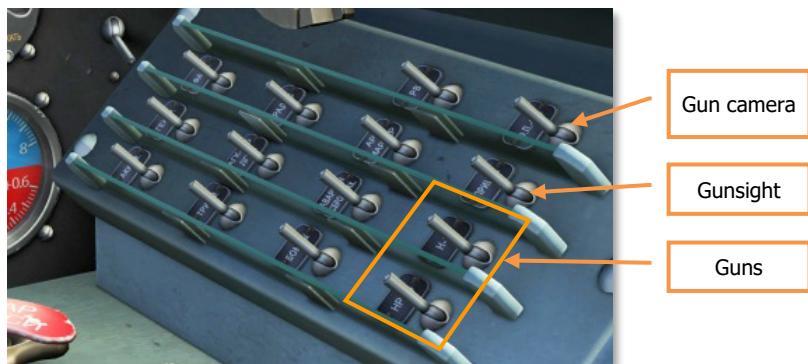
- **Gun ready lights.** From left to right, each red light indicates the readiness of the left 23 mm, right 23 mm, and 37 mm gun for fire, respectively.
- **Bombs armed lights.** When AIR-TO-GROUND mode **7** and bombs are selected, the bombs arming switch will be automatically switched on. Red light indicates that the bombs are armed.

Guns Employment

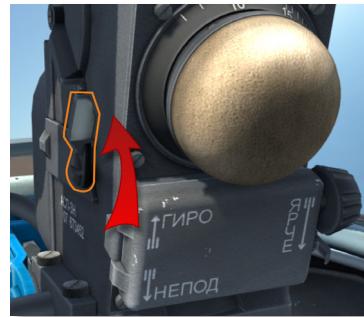
Air-to-Air Employment

Perform following steps to use the guns against aerial targets:

1. Press **6** to select AIR-TO-AIR mode. Guns and gunsight ACBs on the right electrical panel will be switched on.



Sight set to GYRO mode (caging lever UP).



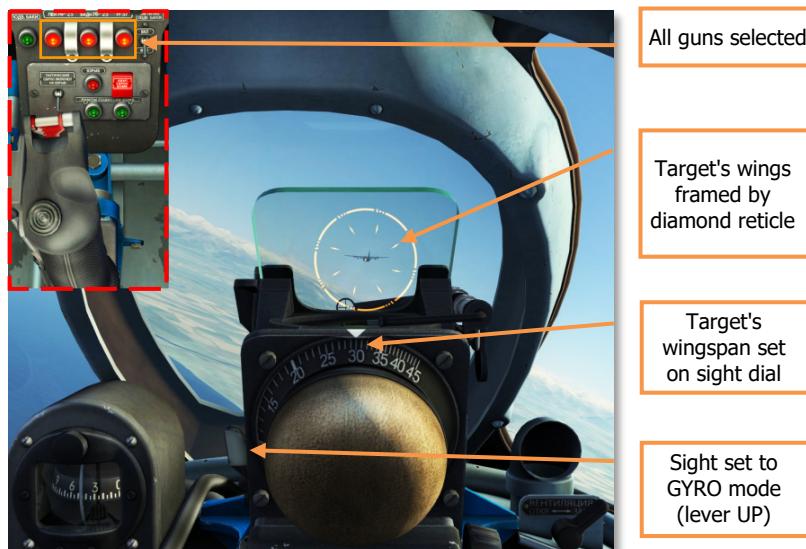
- Set the target wingspan on the target wingspan adjustment dial **[/]** / **[,]**.

An average fighter-sized target will have a wingspan of 10-15 meters. An average medium-sized transport or bomber aircraft will have a wingspan of 30 meters. A large bomber may have a wingspan of approximately 50 meters.

- Place the sight reticle on the target and continually adjust the throttle twist grip as required to "frame" the target's wingspan inside the sight reticle diamonds to enter correct range data into the sight **[,]** / **[;]**.



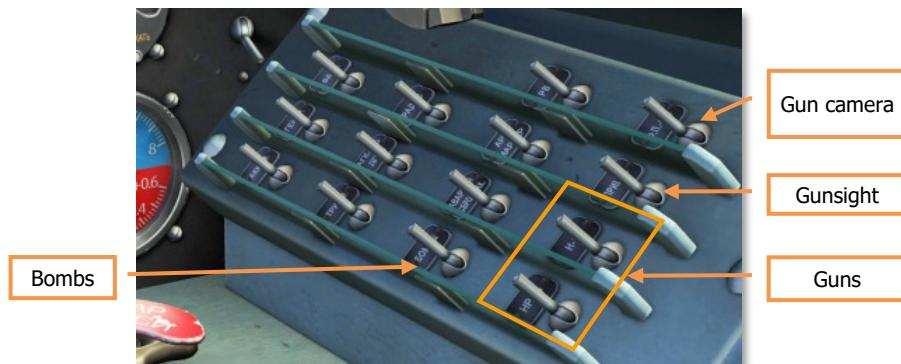
- Press **[L.Ctrl]** + **[Space]** to select type and number of guns to be employed – 2 x 23-mm guns / 1 x 37-mm gun / 2 x 23-mm guns + 1 x 37-mm gun. Press **[Space]** to fire selected guns.



Air-to-Ground Employment

Perform following steps to use the guns against ground targets:

1. Press **7** to select AIR-TO-GROUND mode. Guns, bombs and gunsight ACBs on the right electrical panel will be switched on.



Sight set to CAGED mode (caging lever DOWN).



2. Set the target size on the target wingspan adjustment dial **/** / **.**
3. Place the sight reticle on the target and "frame" it inside the sight reticle diamonds using the throttle twist grip **;** / **;**.

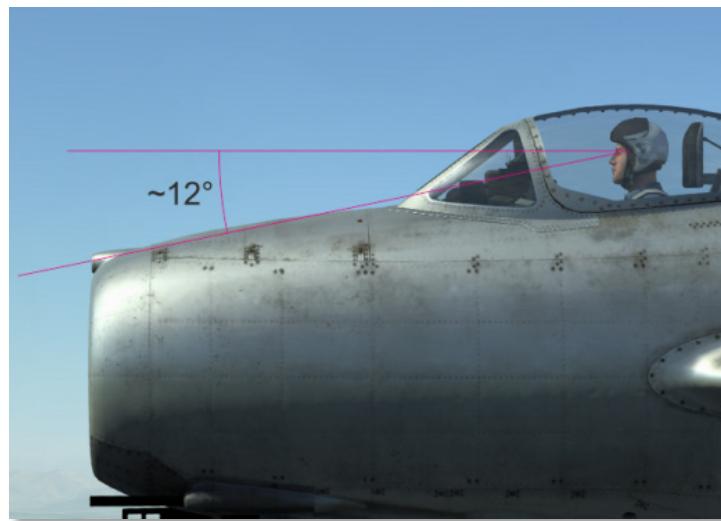


4. Press **L.Ctrl** + **Space** to select type and number of guns to be employed – 2 x 23-mm guns / 1 x 37-mm gun / 2 x 23-mm guns + 1 x 37-mm gun. Press **Space** to fire selected guns.



Bombs Employment

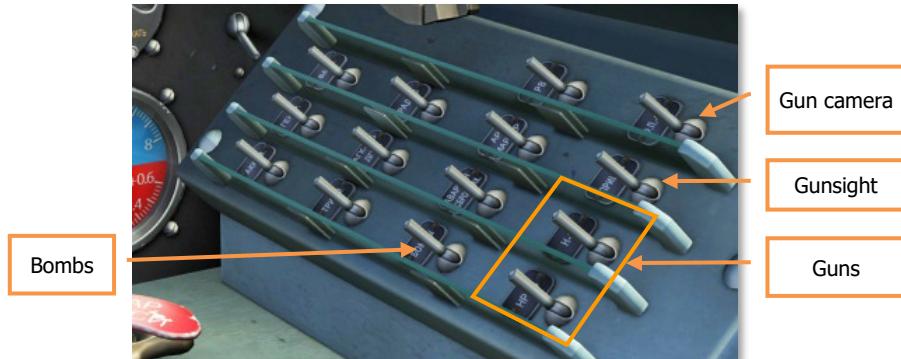
MiG-15bis is not equipped with a specialized bombsight. To use bombs pilot must aim visually. This is the skill that can be improved by practicing. The line extending the pilot's eye and passing through the gun camera S-13 lens location is used for aiming:



The best bombing results are achieved at steep diving angles up to 45 degrees and even more. Pilot has to take into account that target area ingress, aiming during bomb run and egress require certain amount of time. Recommended altitude range for bombing: ingress – not less than 2000m over target, egress – not less than 1000m.

To execute a bombing run, perform the following steps:

1. Press **7** to select AIR-TO-GROUND mode. Guns, bombs and gunsight ACBs on the right electrical panel will be switched on.



The bombs arming switch (ТАКТИЧЕСКИЙ СБРОС ВКЛЮЧЁН НА ВЗРЫВ) has to be set to the upper position. The bombs armed light and two green lights, indicating that bombs are on pylons, should be illuminated.

2. To have a better view on target, it is advisable to flight to the target area with such a heading relative to the target, that the target "moves" along the canopy side window to the left bottom corner of the non-movable part of the canopy.



Optimal altitude is 2000-2200m and speed is about 400 km/h.

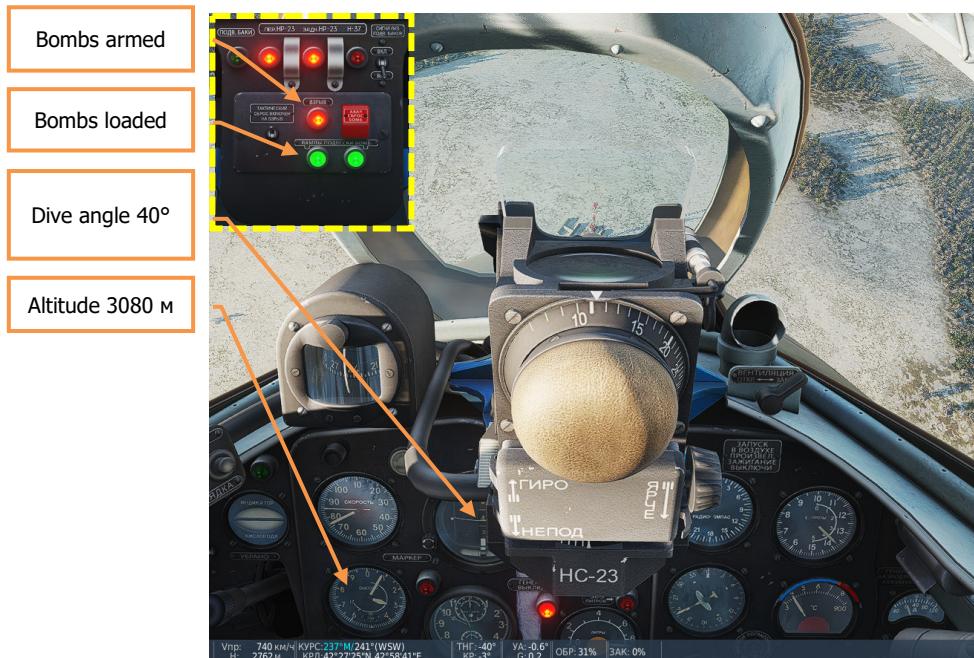
3. When the target line of sight is close to 10 or 2 o'clock, pilot has to do the following:

- set the engine RPM to 6000 maximum;
- establish line of sight of the airplane nose by lifting "pilot's head", as shown on the picture by pressing **R.Shift + R.Ctrl + Num8** :



- When the target line of sight is at 10 or 2 o'clock, roll the airplane towards the target with 45-50° roll angle and simultaneously initiate the dive with 30-45° dive angle.

- Correct nose deflection from the target in a way that target starts moving towards the line “eye-gun camera S-13 lens location”.
4. At altitude of 800-1200m release the bombs **RAlt+Space**. Speed will increase up to 500-550 km/h during the dive. Do not exceed 600 km/h, use speed brakes if necessary **B**.



5. Retract the speed brakes **B** while egressing from bombing run.

To have a consistent result, practice is required. You should remember that:

- increased speed while releasing bombs leads to increased bombs overfly (projection of the trajectory of the falling bomb on the horizontal surface);
- reduction of the dive angle leads to bombs overfly;
- increased bombs release altitude with the same dive angle leads to bombs underfly.