Серебряная стрела

МиГ-15 бис

Important note

At now MiG-15 bis project has status of beta version.

But most of things that you can treat as «bugs» are not errors, but limitations. Purpose of that limitations is give to You concentrated feeling of genuine aircraft possibility restrictions. On real-life MiG these restrictions are softer, but attempt to ignore them completely may cost Your life really. On simulation it's hard, but You can simply restart simulator.

With best regards,
	Victor Slavutinsky, vitosnet@mail.ru

Main panel

1. Flaps mode lamp
2. Oxygen mask manometer

Pilot automatically put mask on if cabin pressure get lower than pressure on 1km above sea level. Keep an eye on oxygen pressure. TODO is lowoxy blackouts.

3. Gear retract\extract lever

Watch speed on gear extraction. Gears stuck on retracting on speeds beyond 350 km\h, but can be extracted to full and retracted after speed lowering. Extracted gears tears apart on speeds beyond 500 km\h. Teared gears and flaps can be restored by "MiG-15bis\Repair aircraft" menu, but if aircraft in unallowed state, like in fast dive, it will be teared apart again.

For full repair use "MiG-15bis\Repair aircraft", it set aircraft in startup state, on runaway too.

4. Gear position indicator

Every lamp must light after gears extracting or retracting.

5. Magnetic compass

May be needed to adjust before flight.

6. Speedometer
7. Manometric altimeter

Count altitude on pressure difference, get sea level as zero. Adjust zero before flight, You may kiss Earth on bad weather conditions otherwise.

8. Radio altimeter

Function on signal reflection principle. For that reason lies on deep turns.

9. Gear extraction warning lamp

Lighted on if altitude and speed is low and gear is retracted.

10. Marker lamp
11. Headsight

Have got his own view, You may switch to it by pressing V or Shift-V. In that view distance from eye to sight is regulated by ring below it. On main gyro mode of sight, size of target is adjusted by external ring of central sphere regulator, and sphere itself set distance to that target. Average size of fighter is 10-20m, bomber is 30m. Set target size, and adjust size of sight to visible size of target. In that case headsight show real forestalling. Distance adjusting may be performed by keyboard, D and Shift-D. Headsight may be lowered on landing for better runaway visibility by pressing Ctrl-D.

12. Gyrohorizon

Show view on Earth from plane, but Earth is on the top, so view is upside down. Tell lies after fast turns, but You may proceed horizontal flight, press button on right of it, and press button again after horizon is autoadjusted.

13. Clock

Adjustable. Got stopwatch and can show flight time. To nine days, inclusive.

14. Turn indicator

15. Main stick

Rough turns can lead machine to crash. Read "main restrictions" paragraph. Cannon and photo switch safer is Ctrl-F, fire and shot is F, dropping of external tanks is Shift-F.

16. Photo camera power lamp

If photo camera is on, every fire button pression make copy of simulator window in main directory. May work only on Linux.

17. Generator disconnection warning lamp

Turn generator on after engine start, immediately. In reality plane can fly on battery about half of the hour. In simulation only in one single minute.

18. Photomachinegun power switch

In photomachinegun mode prolonged fire button pressure set view to headsight and creates in root directory screenshots of it, with one second interval. Use that mode reasonably, You would get hard disk overblowing in other case. Photomachinegun allow to play «fighter school» game by comparison of aiming accuracy.

19. Vertical speedometer

20. Fuel level indicator

21. Mach number indicator

Watch Mach number regularly. On Manch number beyond 0.88 near sonic effects begins that can lead to lost of control and aircraft crash. Each effect is descrbed in "Main restrictions" paragraph in detail.

22. Photo shot process lamp

23. Fuel remnant warning lamp

Lighted on if fuel remnant is undersize of 300l, it's half of the hour flight approximately. Remember, there's no engine without fuel, no generator without engine, no possibility to flight far or even fully control machine on single battery alone.

24. Air ignition warning lamp

25. Radio compass indicator

Radio compass contol box may be finded on right panel.

26. Gyro compass

Needed to adjust before flight. Lie after fast turns, autoadjusting can be performed by pressing vernier below, just as gyrohorizon.

27. Fuel pressure, oil pressure, oil temperature indicator

28. Engine rotation per minute indicator

29. Exhaust gaz temperature indicator

Control rotation, engine may turn off on long overheating beyond 800°C level.

30. Oil pressure indicator for high altitude flights

31. Voltampermeter

In reality has switch knob, in simulator show ~ 100A if generator is on and lesser values in single battery short-terms flight.

32. Cabin pressure and pressure difference indicator

38. Drop tank fuel level indicator
39. Drop tank indicator switch
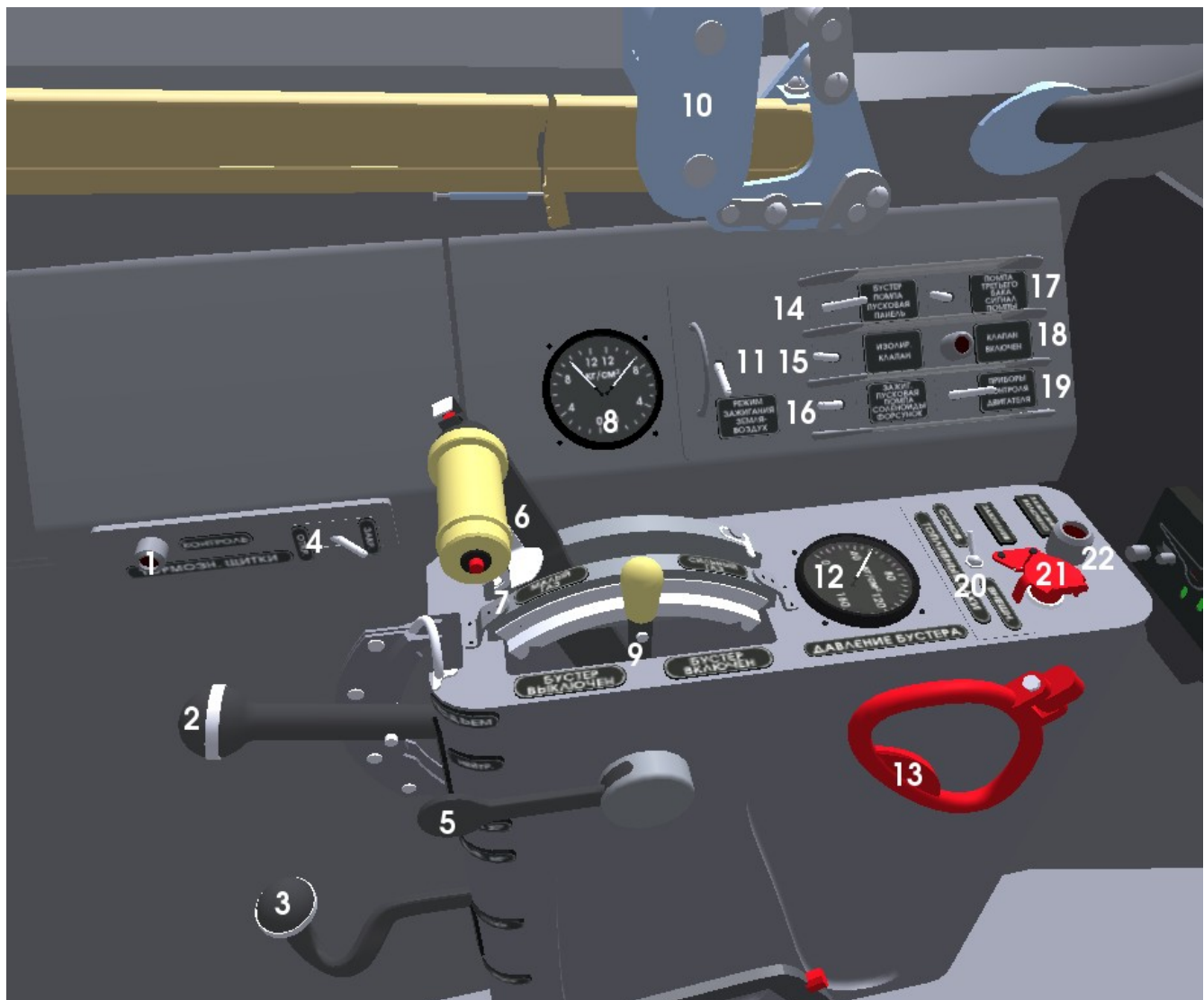
To check if the drop tanks are empty:
- Turn on switch (39).
- Accelerate the engine to more than 6500 RPM.
Then the light (38) is on if the drop tanks are empty.
(If engine RPM is below 6500 RPM, the light will always be on.)

Left panel

1. Speedbrakes indication lamp

2. Flaps control lever

Flaps tears apart on middle position and speeds beyond 450 km\h or lower position and speeds beyond 350 km\h.

3. Engine emergency brake

If it on engine is off.

4. Speedbrakes power switch

In reality only turn power on, speedbrakes control performed by button on the top of the throttle lever. In simulator extract speedbrakes directly.

5. Throttle lever position holder

On fast turns throttle lever may be moved by g-force. Use fixation by R key pressing.

6. Throttle lever

7. Low throttle safer

Engine can perform on low throttle mode only short time. After ignition lift throttle up , and switch safer on by Shift-R.

8. Gear brakes system pressure indicator

MiG have no parking brake. So, that's why in parking mode brakes system pressure is constantly high.

9. Aileron booster lever

In simulator have three modes. Can be switched by Q and Shift-Q. Without booster roll turns are difficult, but executable. In emergency landing case imagine that You control big airliner on roll and still MiG on pitch and yaw.

10. Canopy locker

Real aircraft can not be controlled practically if canopy is open on speeds beyond 500km\h. In simulator that limitation can be implemented too.

11. Ignition mode switch

Engine can not be started in flight same way as on Earth, on the score of air flow that turns turbine already. On air engine start procedure described in relevant chapter.

12. Aileron booster pressure indicator

13. Left gear emergency upright extraction holder

Emergence gear extraction procedure described in relevant chapter.

14. Mail pump, aileron booster, ignition panel power switch

In real plane switch are safers, too. In simulator that switch knocks out on attempt to move gear or flaps on single battery power.

15. Engine isolation valve power switch

In reality that switch is needed at case of engine and pumps failure and oil overheating. In simulation it allow to lower throttle to minimum values without engine shutdown. Can be used at landing. Allows to reach speed beyond 950 km\h on descent. Engine can not be started if that valve is on.

16. Ignition power switch

After engine start turn it off immediately, both in on Earth and on air startup cases. Otherwise, power would shut down. Spontaneously.

17. External tanks pump power switch

Switch fuel system to external tanks. Fuel system automatically switch back on main fuel tank if no external tanks presented or no fuel remain in external tanks.

18. Isolation valve indication lamp

19. Engine control instrumentation power switch
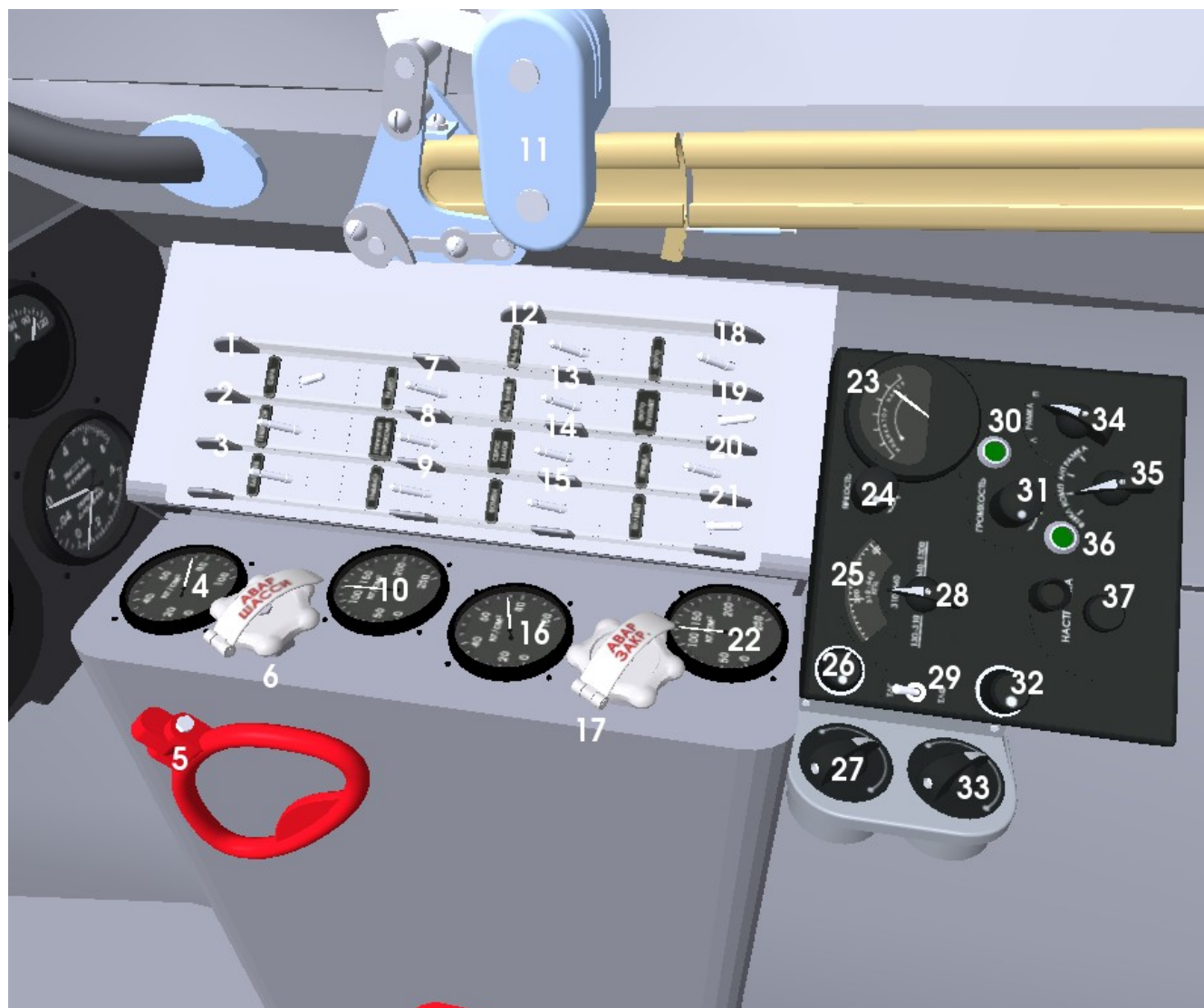
20. Balance tank switch

Switch fuel system to back balance tank. Fuel system automatically switch back on main fuel tank if no fuel remain in it. Use fuel from balance tank in the middle of long duration flights for better stick adjusting in addition to trimmer.

21. Engine start button

22. Ignition power indication lamp

Must be off in normal flight.

Right panel

1. Extracted headlight power switch

TODO headlight after final solution of light sources in FlightGear.

2. Generator switch

Turn generator on immediately after engine startup, but not before. Engine could not be started with switched on generator, both on Earth and in air.

3. Battery switch
4. Reserve gear extract system pressure indicator

5. Right gear emergency upright extraction holder
6. Emergency gear extraction valve
7. Radio station power switch

Will be implemented after research of FlightGear radio features.

8. Hyrohorizon and hyrocompass power switch
9. Trimmer power switch
10. Main gear extraction system indicator
11. Canopy locker
12. Radio altimeter power switch
13. Radio compass power switch
14. External tanks dumping power switch
15. External tanks explosion power switch
16. Reserve flaps extract system pressure indicator
17. Emergency flaps extraction valve
18. Photo system power switch
19. Photomachinegun power switch
20. Headsight power switch
21. Cannon power switch
22. Main gear extraction system indicator
23. Radio compass reception quality indicator

If pointer is on right side then radiocompass really show the way. To someplace.

24. Radiocompass indicators brightness control
25. Radiocompass reception frequency scale
26. Radiocompass telegraph modulated signals reception volume control
27. Aileron trimmer control

If plane constantly rolls on neutral stick position flight, try to accurately move that control.

28. Radiocompass band selector

Most beacons have frequencies in 300-400khz, it's middle position of that selector.

29. Radiocompass recieving mode switch

In upper position of that switch, telegraph mode, You should heard Morze code in case radiocompass tuned on beacon correctly. In lower mode You should hear some music.

30. Radiocompass effective reception indication lamp

Lighted on if radiocompass really pointed on someplace.

31. Radiocompass frame signals volume control

Then tuned on beacon, radiocompass show direction, further to pointer, by stereo sound. If you bored by that sound, turn that control.

32. Radiocompass telephone modulated signals reception volume control

33. Elevator trimmer control

If plane constantly pith up or down on neutral stick position flight, try to accurately move that control.

34. Radiocompass frame rate control

Function in manual frame control mode. Use that mode if radiocompass reaction time is lower than Yours.

35. Radiocompass mode selector

Radiocompass modes, from left to right:
Off
Main mode. On right tuning on beacon shows direction to it by pointer on main panel and stereo sound.
Audio tuning mode. Without right tuning plays noise, with plays Morze code or music.
Manual frame rate control mode. Same as main mode, but faster or slower.

36. Radiocompass power indication lamp

37. Radiocompass tuning control

Firstly set right band by selector.

On Earth engine startup sequence

1. Check that every load switched off, on right panel
2. Turn battery on, on right panel
3. Check generator is off, on right panel
4. Turn engine emergency brake off, on left panel
5. Turn on main pump and external tanks pump, on left panel
6. Check ignition type switch is set to on Earth ignition mode
7. Check isolation engine valve is off
8. Turn ignition on, on left panel
9. Turn engine control instrumentation on
10. Check throttle lever is on extreme near position and low throttle safer is off
11. Check throttle lever position holder is off
12. Press and hold ignition button
13. Wait approximately 30 seconds to full engine startup
14. Move throttle lever forward, set low throttle safer, move throttle lever to last near position
15. Turn ignition power off
16. Turn generator on

Takeoff

1. Startup engine
2. Check flaps is retracted, press [double times
3. Turn parking brake off, press Shift-B
4. Set throttle to full
5. Move main stick forward little bit
6. On 200 km\h lover throttle to 7000rmp for better control
7. Stay on runaway to 250km\h
8. Move main stick near, ascent angle is 15°
9. Retract gears right after takeoff
10. Set throttle to 10000rpm

Gears stuck on retracting on speeds beyond 350 km\h, but can be extracted to full and retracted after speed lowering. Extracted gears tears apart on speeds beyond 500 km\h. Engine may turn off on long overheating beyond 800°C level.

Landing

1. Check that balance tank was used
2. Extract gears on 350km\h
3. Proceed descent at 300km\h and 5°angle
4. Extract flaps to full
5. Use speedbrakes if needed
6. Touch down at 200km\h by main gears only
7. Set throttle to last near position
8. Put front gear down slowly by stick
9. Use brakes then front gear is on runway only
10. If speedbrakes was retracted on touchdown, extract in on speed lower than 150km\h

Gears tears apart on touch down with overload beyond 2g, front gear touchdown with angle speed beyond 10 deg\sec, only front gear touchdown. Gears tears apart on attempt to land without runaway, or rolling with speed beyond 75 km\h or without runaway. Ground runaways allowed.

In air engine startup procedure

1. Switch generator off
2. Switch every load on right panel off, except trimmer and horizon
3. Check battery is on
4. Check isolation engine valve is off
5. Move ignition type switch to in air ignition mode
6. Move throttle lever in middle position
7. Turn ignition power on
8. Proceed descent with constant speed between 300km\h and 400km\h
9. Smoothly move throttle lever to last forward position and then to last near position to character engine startup sound and increasing of engine rotation speed
10. Wait to full engine startup
11. Turn ignition off
12. Turn generator on
13. Move ignition type switch to on Earth ignition mode

Emergency gears extraction procedure

1. Draw out left gear emergency upright extraction holder
2. Draw out right gear emergency upright extraction holder
3. Move gear lever to lower position
4. Draw out emergency gear extraction valve holder
5. Turn emergency gear extraction valve holder

After emergency extraction gears could not be retracted.

Emergency flaps extraction procedure

1. Move flaps control lever to lower position
2. Draw out emergency flaps extraction valve holder
3. Turn emergency flaps extraction valve holder

After emergency extraction flaps could not be retracted.

Emergency landing

Land with retracted gears, external tanks dropped, on speeds lower than 250 km\h, and as low g as possible. Watch for appropriate place, craft can be destroyed by house or tree collision.

Main restrictions

1. Engine shut off on long overheat beyond 850°C level

2. Engine shut off on long stay in unsafed low throttle position

3. Battery shut off on long flight with offlined generator

4. Battery and generator shut off on long ignition power engaging

5. Pump power switch shut off on attempt to retract or extract gears or flaps on single battery power

6. Flaps tears apart on middle position and speeds beyond 450 km\h or lower position and speeds beyond 350 km\h
7. Gears tears apart on moving with speed beyond 75km\h without runway
8. Gears stuck on retracting on speeds beyond 350 km\h, but can be extracted to full and retracted after speed lowering
9. Extracted gears tears apart on speeds beyond 500 km\h
10. Gears tears apart on touch down with overload beyond 2g, front gear touchdown with angle speed beyond 10 deg\sec, only front gear touchdown
11. Gears tears apart on attempt to land without runaway . Ground runaways allowed
12. On Mach number beyond 0.88 and altitudes below 3000m, or Mach number beyond 0.92 and altitudes beyond 10000m spontaneous heeling turn begins, that grows fast with Mach number growing
13. On Mach number beyond 0.9 on every altitude spontaneous pitch angle growing turn begins, that grows fast with Mach number growing
14. Ailerons effectiveness lowers with Mach number growing, becomes zero on 0.94 Mach number, and become negative after. That means moving stick to right turns craft on left by roll angle
15. Machine destroys on g loads beyond 8g. Near maximum allowed level approach can be noticed by begin of oscillation by roll and yaw axis and crackle sound

Main MiG-15 keyboard shortcuts

1. Ctrl-F – cannon and photosystem button safer
2. F -fire and shoot
3. Shift-F – dump external tanks
4. Shift-C – open\close canopy
5. Q\Shift-Q – aileron booster control
6. Ctrl-Q – main pump power switch
7. R - throttle lever position holder
8. Shift-R - low throttle safer
9. Ctrl-R – engine emergency brake
10. Shift-S – ignition mode switch
11. Ctrl-S – gnition power switch
12. D\Shift-D – headsight distance adjust
13. Ctrl-D - headsight up\down
14. E - battery
15. Shift-E – generator
16. Ctrl-E – engine control instrumentation
17. ` - engine isolation valve