



PT Team

Ilyushin Il-62 M

Operating Manual

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Introduction

Airplane Geometrical data and selected limitations

Airplane length	53,12 m
Airplane height	12,35 m
Wing span	43,2 m
Wing area	279,55 m ²
Center of Gravity range	27-34 CAX
Maximum flap angle	30 °
Maximum taxi weight	166000 kg
Maximum take-off weight	165000 kg
Maximum landing weight	105000 kg
Allowable rest of fuel at max. Landing weight	32 000 kg
Maximum zero fuel weight	95500 kg
Maximum payload	23 000 kg
Maximum operating Mach number	0,83
Maximum operating speed (IAS)	600 km/h
Maximum operating speed in emergency case	700 km/h
Maximum speed (IAS) at Flaps 15 °	400 km/h
Maximum speed (IAS) at Flaps 30 °	360 km/h
Maximum speed (IAS) at takeoff and landing gear retraction, weight < 140t:	400 km/h
Maximum speed (IAS) at takeoff and landing gear retraction, weight > 140t:	450 km/h
Maximum speed (IAS) at длительном flight with undercarriage down	550 km/h
Minimal landing speed (IAS)	235 km/h
Maximum allowable cross wind speed (angle 90 ° to runway) during takeoff and landing: at a friction coefficient 0,55 and more	15 m/s
in CAT II conditions	10 m/s
Maximum allowable wind speed (any direction)	25 m/s
Manoeuvrable operational G-loads for all weights	from +0,5...-2,0
Maximum altitude at various flight weights should not exceed the following values:	
Weight, t	165 157 141 126 115 109 and less
Altitude, m	9600 10100 10600 11100 11600 12100

Usage of landing lights on the ground and in flight should not exceed 5 minutes

General remarks

The Il-62 model continues the concept of the previously released Ilyushin Il-18D, Antonov An-24 and Tupolev Tu-154B2 models.

The main attention is given to the flight-navigation complex.

At the first stage the engineering systems are only present to a minimum degree, which means the panel is primarily intended for the pilot and the navigator. The main concept difference to the Tu-154B2 model consists in an attempt to combine realism of system activity with simplicity of operation.

Preflight preparation is simplified. Engine start-up is possible using Ctrl-E and the majority of the systems are started at loading. The airplane has three navigational systems, the Doppler navigational system NV-PB, two complete inertial navigation units I-21 and the GPS system KLN-90B.

Attention!

Panel and dynamics are a unified complex. Editing of dynamics can result in unforeseeable problems down to crashes to desktop. It especially concerns landing gear and fuel system parameters, as non-standard functions are applied for modeling of the landing gear tail support and fuel system activity.

And even more **Attention!**

It is not recommended to use the FS standard menu of refuelling and loading (Fuel and Payload). In this case correct functioning of the model is not guaranteed. Use the built-in loader-fuel menu in the panel (shift_9).

Due to many custom functions, the first step after loading the plane in Flight Simulator 2004 MUST be the setup of your Joystick hardware. This must be done only once and does NOT affect the functionality of your default FS Joystick setup, so no worries. For Il-62M operation, the standard FS Joystick must be turned OFF (CTRL-K). For your other airplanes, simply turn default FS Joystick ON using CTRL-K again.

The Il-62M custom Joystick setup is described in detail in Chapter 2.1 !

1. Basic Panel Operation and Description

The system of panels uses a style similar style to the Tu-154 and Il-18. There are two main workplaces for the Captain and the Navigation officer. The workplace of the commander is located in the main view and contains several subpanels. Some devices on the Captains panel are located on the Copilot panel of the real plane. On the left sub-panel (Shift_1) of the Captain the switches for pitot heat, second radio altimeter and the COM2 board are duplicated. It is connected to the necessity to provide high-grade airplane control by just one crew member (YOU !!), even at some violation of realism. The visual realism of the overhead panel is also slightly changed. It contains only devices which demand the most attention in flight.

Subpanels :

Shift-1 : Captains Left Panel
Shift-2 : Autopilot Panel
Shift-3 : Overhead-Panel – lower part
Shift-4 : Fuel gauges/Flowmeter panel (overhead panel part)
Shift-5 : Copilot ADI and HSI
Shift-6 : KLN 90B GPS (beta)
Shift-7 : Weather radar Groza (beta)
Shift-8 : Fuel pumps/crossfeed panel
Shift-9 : Fuel-Contents and Loadpanel

Ctrl-Numpad1 : Navigator Panel
Ctrl-Numpad3 : Copilot Panel
Ctrl-Numpad8 : Overhead Panel Upper Part (Fuel Jettison, etc.)

Returning to the main panel FROM the Navigator or Copilot panel or Upper Overhead Panel can be done using the **Spacebar**.

One more panel is located in the back (rear) view, it contains just a bunch of toggle switches at this stage. All toggle-switches are already turned on at loading and do not demand attention in flight. An exception are seven toggle-switches in the lower right corner. These are the power switches of the automatic control units for crossfeed of tanks 5 and 6. If an automatic pump disconnect occurs, its repeated activation is possible only after cutoff and actuation of the power switch (like in reality). From left to right there are toggle-switches of tank 5 left, tank 6 and then tank 5 right. "To distort" all these power switches it is also possible to open and close the loader panel.

At the forward-up view (Ctrl-8 at switched off NumLock) a part of the upper overhead panel is located. It contains boards for swapping and dumping of fuel. At normal operation all this is not necessary, but intended for representation of the fuel system of the real airplane. On the same panel you find four toggle-switches for coupling/decoupling of the autothrottle control from thrust lever and, furthermore the fire valve switches. All of them are hidden under caps. One very lonely toggle-switch without cap and inscription turns on panel illumination. A more convenient place wasn't found, so it found it's shelter here.

1.1. Captains Main Panel



Additional Clickspots :

- A NV-PB Info panel
- B Joystick Service Panel
- C virtual Navigator Assistant
- D Navigator Panel
- E Throttle Panel

- 1 **Attitude Director Indicator (ADI)**
Pitch Scale with 10 degree marks (broad with number) and 5 degree marks
Bank Scale from 0 deg to 60 deg, 15, 30, 45 deg with number labels.
Between 0 and 30 degrees one mark indicates 5 degrees.
Localizer Deviation indicator on top, Glideslope Deviation indicator to the left, Sideslip Indicator at the bottom
Flight Director bars are only visible if corresponding Autopilot mode is active (see Autopilot Chapter below)
Clickspot at bottom left serves for fast alignment, clickspot at bottom right for vertical adjustment.

- 2 **Horizontal Situation Indicator (HSI)**
shows Heading bug on inner scale (controlled from big Autopilot turn knob or NV-PB Navigation mode) and vertical (Glideslope) and lateral course deviation bar.
The heading pointer in navigation mode shows heading from the NV-PB systems (also when I-21 and KLN are in use), in other modes it is the setting device for selected heading (or track at active Doppler System DISS). The heading is set using the handle of the AP panel, the knob 3K on the HSI is not connected. The slender pointer at active Doppler System DISS is the drift indicator.
- 3 **MACH Indicator**
- 4 **Indicated Airspeed (IAS) Indicator**
the red index is normally slaved to needle, but controlled separately by Autothrottle Speed Lever when Autothrottle Mode is active. Unit **km/h**
- 5 **Pitch attitude indicator** in degrees
- 6 **NV-PB Deviation (Z) and distance (S) indicator**
connected to active Waypoint Set
- 7 **Radio Magnetic indicator RMI**
yellow needle for VOR1 or ADF 1, double needle for VOR2 or ADF2
left clickspot switches between ADF1 and VOR1, right clickspot between ADF2 and VOR2
- 8 **Elevator, Aileron and Rudder position indicator**
- 9 **True Airspeed (TAS) / Groundspeed Indicator**
Clickspot below switches between TAS/Groundspeed. Unit **km/h**
- 10 **RSBN or VOR1 Azimuth (left) and Distance Indicator in KM (right)**
- 11 **DME2 indicator (in KM)**
- 12 **Brakes and parking brake pressure indicators**
- 13 **Landing Gear Status indicator**
three red lights for retracted position, three green for extended position
Clickspot at bottom center to test signal/warning lights.
- 14 **Flaps Position indicator**
Scale 0 to 30 degrees
- 15 **Vertical Speed Indicator**
Scale from 0 to 30 meters/second
Contains TCAS range Rings, if TCAS System active. Clickspot on bottom right sets TCAS range, clickspots on upper right turns TCAS rings off.
- 16 **Standby Attitude Director Indicator (ADI)**
Clickspot at upper right for fast alignment, clickspot at bottom left for vertical adjustment

- 32 **Landing gear tail support indicator and buttons**
upper button : retract
lower button : extend
- 33 **Electric trim lever**
Clickspots above and below the lever
- 34 **Autothrottle Speed Lever**
Clickspots above (increase speed) or below (decrease speed) lever
- 35 **Landing/taxi light selectors**
from left to right
- not used
 - extend / retract the landing lights (also animated at the visual model !)
 - not used
 - three position switch : landing lights / off / taxi lights. Cover must be opened with right mouse button first. Note the unique asymmetric landing lights !
 - not used
- 36, 38 **various signal lights**
e.g. Flaps, Stabilisator not in takeoff position, parking brake
- 37 **Clock** Clickspot right : Stopwatch Start/Stop/Reset
- 39 **Navigation device signal selector**
The switching of Course-MII (VOR/ILS) signals to the navigation devices is made with the help of this signal selector. There are three selector positions : 1, COBM and 2.
- In position 1 the first Course-MII unit provides signals to both HSI's (HIII). In position 2 correspondingly the second unit. In COBM position the signal from the first is visible on the left HSI (HIII) and on the right HSI from the second.
- 40 **Audio Signals on/off**
- 41 **External lights selectors**
- two leftmost switches not used
 - beacon light
 - strobe light
 - navigation lights
- 42 **Battery switch** (Akkumulator).
open cover with right mouse button

1.2. Captains Left panel (Shift-1)



- 43 **MSRP-64 Flight data recorder** (described in Chapter 5.3)
- 44 **various Test Switches**, will be explained in future manual versions
- 45 **vertical gyroscope alignment button** (press and hold minimum 10 seconds) - GGV Kontr (Alignment Button on ADI lights up, AG Flag is visible and GGV Kontr lights up on signal light panel 28).
- 46 **PB-5 Radar Altimeter power** (left - Captains RA, right - Copilots RA)
- 47 **Transponder / TCAS Unit**
Left Knob for turning the unit On (right mouse button on center) and for switching between mode above/below and to change TCAS range (+/- clickspots).
Right Switch sets the mode : TST, SBY (Standby), ON, ALT, VFR, TA (Traffic Advisories), TA/RA (Traffic and Resolution Advisories).
- 48,49 **COM 1 Unit, COM 2 Unit**
- 50 **Nose Wheel steering mode**
This switch serves for management of nose wheel steering, switch between 10 deg steering angle (for takeoff and landing) and free turn.
- 51 **SVS System Test Switch**
press and hold, metric altimeter on Navigator panel must move to 12000m
- 52 **Pitot Heat Switch**
- 53 **Alternate Landing Gear Switch**
This switch actuates the signal sound for the 'extend landing gear' signal (выпусти шасси)
- 54 **Automatic spoiler retraction switch**
turn on to automatically retract extended spoilers when moving Thrust levers above climb power (in Russian terms 'nominal mode'). Very useful in case of a Go-Around.

1.3. Autopilot CAY-1T-2

Overview

The Autopilot panel can be opened using Shift-2



Autopilot controls and indicators :

56-64, 66-74 and 81-83 serve as combined buttons and indicator lights.

- 56 main automatic control of stabilizer rearrangement (АПС)
- 57 backup automatic control of stabilizer rearrangement (АПС)
- 58 cutoff of main or backup automatic control of stabilizer rearrangement
- 59 Altitude hold mode
- 60 Mach Hold Mode (stabilized by pitch control) or AT Mode
- 61 Speed (IAS) Hold (stabilized by pitch control) or AT Mode
- 62 main Autothrottle channel
- 63 backup Autothrottle channel

- 64 cutoff of main or backup Autothrottle channel
- 65 Switch serves for reduced transitions in roll and pitch channels during turbulent weather. If turbulent weather is not present, the switch is left in position «Норм» and guarded
- 66-68 main, backup and cutoff yaw channel
- 69-71 main, backup and cutoff bank channel
- 72-74 main, backup and cutoff pitch channel
- 75 Switch for preparation of autopilot channels activation circuits. On the ground it should be switched off and guarded.
- 76 Indicator for "Roll" handle not in neutral position and turn completion from "Roll" handle .
- 77 Lateral mode selector
- 78 «Крыс» knob for control of lateral motion in "Крыс" mode. (Pre)sets heading bug on both HSI (НПП).
- 79 Roll knob (Крен) for turn execution at active roll and yaw channels. During turn the airplane bank angle is proportional to a turn angle of the knob. To turn the handle, it should be pressed previously, so the indicator lights up and the active operational mode of the roll channel previously switched off (the lamp «Гориз» goes out)
- 80 Descent-Climb handle (Спуск — Подъем) for longitudinal control. The change of pitch angle is proportional to the turn angle of the handle. By pressing the handle the active altitude-hold mode or speeds or Mach mode is deactivated.
- 81 Button for simultaneous activation of yaw, roll and pitch channels. If any channel is faulty, the corresponding back-up channel is activated
- 82 Button for activation of the roll channel in the modes :
- selected heading / track (Управление заданным курсом - путевым углом)
 - control from navigation system (NV-РВ, KLN-90В or I-21)
 - automatic approach control (Автоматическое управление при заходе на посадку) depending on position of the lateral operating mode switch
- 83 Button serves for activation of pitch channel in automatic approach mode, provided that the mode switch is set in position «Заход» (Approach).
- 84 Autothrottle speed selector
- 85 Elevator position (left) and AP electric trim (right) indicator

Practical Operation

After takeoff and climb power set (in Russia that's called engine nominal mode) you are allowed to turn the Autopilot on at no less than 200m AGL.

ATTENTION:

Before you switch the Autopilot on, ALWAYS make sure the airplane is in a steady and well trimmed state. Use Stabilizer trim as a main trim device and elevator trim to trim residual efforts. Additionally ALWAYS check the electric trim tab indicator shows a neutral position. If not, move the electric trim tab to zero using Joystick buttons defined in the Joystick setup device.

Longitudinal Autopilot modes.

Speed Modes V and M (stabilize speed by variation of pitch)

Altitude Hold

Glideslope (covered below, see Approach Modes)

Climb/descend wheel

For AP Climb we will initially use the IAS Mode V, it will stabilize the climb speed at the moment of switching on by varying pitch.

- make sure climb power is set, Flaps are retracted according to schedule and accelerate to a climb speed of 570 km/h. Trim the plane as instructed above.
- turn the «AP. ПИТ» switch 75 to the upper position and close the cap
- press the button 81, it will light up simultaneously with the main pitch, bank and yaw channels 66, 69, 72 . On the AP light signal board, the indicator «KC» will light up. The AP will go in pitch stabilization and wings levelling mode.
- Press button 56 to activate the main automatic control of stabilizer rearrangement (АПС)
- press the Button 61 «СКОР» in the group "СТАБИЛИЗ"
- after reaching $M=0.78$ change to MACH mode by pressing button 57 («MAX»).



Example longitudinal climb or descent situation with Speed Mode V activated

The modes "CKOP" and "MAX" can be switched off by switching to the pitch backup channel 73, by using the climb/descent handle 80 or by activating Altitude Hold Mode 59 ("БЫСОТА"). By the way, the main and back-up channels are equivalent, but the mode "M" (Mach Hold) works only on the main pitch channel.

Use the following technique to enter the CRUISE phase at your recommended flight level or to level off intermediately, e.g by ATC instruction :

- use the climb/descent handle 70 ("СПУСК — ПОДЪЕМ") to reduce the current vertical velocity with repeated key presses. For passenger comfort, the vertical velocity should not exceed 5 m/s before activating Altitude Hold Mode. The lower your vertical velocity at the moment of activation, the smoother the transition.
- activate Altitude Hold Mode ("БЫСОТА") by pressing button 59. On the AP light signal board, «KB» will light up
- at your discretion set throttle to cruise power or use Autothrottle to hold your cruise speed. To turn Autothrottle on, press button 62. Select either Mach (60) oder IAS (61) stabilization. The speed can be changed using the +/- selector 84. You will notice the little red indicator on the Speedometer scale will be no longer slaved to the actual speed and will follow your changes.

While I'm at it : Turning Autothrottle on will automatically deactivate the Speed Modes V or M. Two modes controlling speed at the same time are not possible.

The general autopilot disengagement function can conveniently be placed on one Joystick button, similar to the real plane (located on the control column). The brake trigger can be used in the air for autopilot disengagement. Contrary to the Tu-154, the autothrottle control will be disconnected as well. To get a smooth transition, set the thrust lever to a corresponding setting before AP disengagement. On the Thrust index gauge, check the small yellow index of the Joystick lever position (similar to the white index under the Thrust lever index of the Tu-154B2). In cruise flight

with active Autothrottle, make sure to have the yellow index always combined with the index position. In case of a sudden AP disconnect (for example at TCAS operation) the engine operational “state” will not change then.



Example cruise situation with Altitude Hold, Autothrottle in Mach Mode, Heading Mode and automatic stabilizer rearrangement selected.

Do not forget to include the automatic control unit of stabilizer rearrangement (АПЦ) after Autopilot engagement. It will partially free you from the necessity to balance the airplane. It is especially useful at transient flight stages. The automatic control unit works if the elevator is rejected more than 3 degrees from a neutral position within eight seconds. At presence of a longitudinal acceleration of a certain value the eight-second delay is absent. At rolls more than seven degrees the automatic control unit does not trim the stabilizer.

However, due to weight and/or Center of gravity changes on a long distance flight you might have to disconnect the AP occasionally to retrim your plane.

To initiate the descent phase, turn off Autothrottle reduce thrust accordingly and set the descent/climb handle 80 (“СПУСК—ПОДЪЕМ”) to a vertical speed leading to a descent speed of 0.78M. Now activate the Mach Mode M (MAX) again using button 60. After reaching 570 km/h change to IAS Speed Mode V (СКОР) by pressing button 61 . For any intermediate level-off use a similar procedure as described above.

The longitudinal autopilot channel system of an AP is automatically disconnected at the following conditions :

Mach = 0,82

G-Load <0,65 or >1,35 in cruise, <0.73 or >1.27 in approach mode (30s after Glideslope capture)

Angle of attack equal 0.5 below current maximum on the AOA indicator

In all listed cases an alarm bell sound and the red signal light «СЛЫ ПОД.» are initiated

Lateral Autopilot modes.

Heading Hold / Heading Select Navigation Mode (GPS, INS, HB-ПБ) Localizer Turn knob

The type of the lateral modes to be used is set with the selector 77. It has three positions, from left to right : Approach (Заход), Heading (Курс) and Navig (НАВИГ).

To activate heading select mode, proceed as follows : Set the mode selector to Курс and set the desired heading/track (depending on active Doppler system DISS : off=heading, on=track) using the big turn knob 78. The heading bug on HSI will move accordingly. Now press button 82 (ГОРПЗ) to activate the mode. A light signal «ЗПУ» will light up and the airplane will immediately turn to selected heading/track. The «ЗПУ» pointer on the HSI coincides with the drift angle indicator if the DISS system is alive. The heading select mode stays active until deactivation, so you can anytime set new headings with the big turn knob.

Deactivation of the heading select mode can be done by pressing the button «ОТКЛ» or by pressing the inner TURN knob 79 or moving the Mode selector 77. The light signal «ЗПУ» will change to «КС». The autopilot continues to stabilize current heading.

The inner TURN knob 79 can be used anytime to execute turns with an intended bank rate. It is frequently used by Russian crews to smoothen turns. During turn the airplane bank angle is proportional to the turn angle of the knob. If it gets moved out of neutral position, the control lamp 76 lights up. Other lateral modes can't be used at that stage. The control lamp 76 goes out if the knob is moved back to the neutral position.

With the 77 selector in position НАВИГ (for NAVIG) the Autopilot uses lateral signals from the navigation systems GPS, INS, or HB-ПБ (as selected using the 4-way switch on the Navigator panel INS section). Details regarding the Navigation system will be covered in a separate chapter.

Approach modes

The Approach mode is initiated by setting the selector switch 77 to position **Зах** (for Заход). The Autopilot will stabilize either the current heading or the selected heading specified with the heading bug.

Localizer intercept mode is activated after pressing the button Горпз. At that moment, the heading bug is “free” to set to the approach course using the big knob 78. Depending on the airplane position relative to approach course, the plane will turn immediately to intercept the localizer or turn to get an approximate 30 deg angle before intercept. Please keep in mind, the 20 degree bank angle limitation will lead to overshoots, if you activate the Localizer mode too late.



Autopilot in Localizer and Glideslope intercept mode.

By pressing the button «ВЕРТИК» (which stands for vertical). the Autopilot activates standby mode for Glideslope capture and will initially activate Altitude Hold mode (if not active already). «ВЕРТИК» should be activated 1 dot above the needle at the latest and 30 deg Flaps must be extended. Then the Glideslope gets intercepted automatically.

The test version includes an experimental Autoland mode. Autoland is possible if Autothrottle is active and both radioaltimeters are turned ON. If the Autopilot is not disconnected at an altitude of 25m, either Autoland or an automatic Go Around (see below) will be executed.

The autopilot system check deviations of the localizer and glideslope needle. If a deviation is above the norm, one of the light signal on the “arrow” board (see below) lights up. If even one of these arrows is lighted up at 30m, the signal light 1 in form of a triangle lights up additionally. It is a signal for the pilot to initiate a Go Around. This is also the main criterium for the decision Autoland vs automatic GoAround.

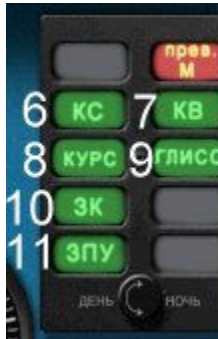
Be prepared, the system might decide for an automatic Go Around ! And generally, the landing gear of the Il-62M is strong, so no worries ☺.

Go Around Mode (УХОД)

Go Around Mode can only be activated using a Joystick button (located at the yoke in the real plane), this button must be defined in the Joystick device. Both roll and pitch channels must be activated. Autothrottle will be activated automatically, if it wasn't active yet.

After activation, the plane initiates a climb with a pitch angle of around 7 deg. AT accelerates up to 330 - 350 km/h and then passes to a mode holding that speed. Roll channel works in the modes 3ПУ or 3К, but roll angles are limited to 4.5 deg.

Autopilot related signal lights



Light signal indicators

A short summary ...

- | | |
|----|-------------------------------------|
| 1 | possible failure, Go around warning |
| 2 | Established in Approach mode |
| 3 | Localizer Deviation exceeded |
| 4 | Glideslope Deviation exceeded |
| 5 | Go Around mode |
| 6 | Course stabilization |
| 7 | Altitude |
| 8 | Localizer intercept |
| 9 | Glideslope intercept |
| 10 | Heading |
| 11 | Track |
| 12 | Autothrottle |
| 13 | Automatic stabilizer rearrangement |
| 14 | HB-ПБ system in standby |
| 15 | upcoming waypoint change (15 KM) |

... and a more detailed description

- | | |
|---|--|
| 1 | Lights up if failures will occur below altitude 60 m.
Go Around is mandatory ! |
| 2 | At altitude 30 m in approach mode, established on elevator, all requirements achieved |
| 3 | At altitude 150 m and lower in approach mode at automatic or director control,
maximum deviations of Localizer needle exceeded |
| 4 | At altitude 150 m and lower in approach mode at automatic or director control,
maximum deviations of Glideslope needle exceeded |
| 5 | Go Around mode initiated. In the real plane, the Go Around button on the control column
is labelled «2 КРУГ», hence the number “2” on the light signal. |

- 6 Autopilot roll channel included and working in mode «КУРСОВАЯ СТАБИЛИЗАЦИЯ» (Course Stabilization). It also lights up:
 at НВ-ПБ or И-21 failure in mode «НАВИГ»
 at failure of RTS of landing in mode «ЗАХОД»
 at failure of two calculators of the lateral channel in mode «ЗАХОД»
 at activation of switch "КС" on the НВ-ПБ unit Р-14
- 7 Activation of altitude-hold mode in flight with active pitch channel. Lights up also in approach mode «ЗАХОД» and pressing of button «ВЕРТИК» until Glideslope capture.
- 8 Lights up during approach time, if the roll channel of the autopilot is included and button " ГОРИЗ " is pressed. Flashes at failure of automatic control on the approach.
- 9 Lights up during approach time if the pitch channel of the autopilot is included, flaps extended to 30° deg and button "ВЕРТИК" is pressed. Flashes at failure of automatic control on the approach
- 10 Navigation mode switch set in position «КУРС», Autopilot roll channel included, button " ГОРИЗ " pressed, and DISS (Doppler) system working in memory mode or DISS failure
- 11 same as 10, but DISS serviceable and actively measuring drift angle
- 12 Autothrottle activation, main or back-up channel
- 13 Activation of automatic stabilizer rearrangement control unit, main or back-up channel
- 14 Navigation mode selector in position «НАВИГ», the roll channel of the autopilot included (main or back-up), button "ГОРИЗ" pressed, , НВ-ПБ serviceable and ready for autopilot “teamwork”.
- 15 in mode «УПРАВЛЕНИЕ ОТ НВ» (see item 14), 15 km before turn to new waypoint.

Other signal lights you might encounter :



Overspeed Warning, above 0.82 M



to the right the elevator out of neutral warning, will be taken care by automatic stabilizer rearrangement mode, if activated.
 The switch below signals nose wheel steering mode

1.4. Il-62M Fuel System

The Il-62M has eight fuel tanks, seven in the wing and one in the fin of the airplane. In the left half of the wing the wing tanks 5 left, 1 and 2 are located. In the right half of the wing the tanks 5, 3 and 4. Tank 6 is located in the wing center section and finally tank 7 in the fin.

Tanks 1, 2, 3 and 4 are the main tanks, each feeding the corresponding engine (tank 1 feeds engine 1, tank 2 for engine 2 and so on). Crossfeed of fuel supplies to engines can deliver fuel from all tanks to a corresponding engine in case of failure.

Tanks 5 left, 5 right and 6 are additional tanks. From tank 7 fuel flows to tank 6 by gravity. From Tanks 5 left, 5 right and 6 fuel is transferred by swapping to the main tanks.

Fuel can also be transferred from tank 1 to tank 2 (and vice versa), from tank 3 to tank 4 (and vice versa), from tank 6 to tanks 1,2,3,4. Simultaneously and in any sequence.

The Il-62M tanks provide the following capacity : (1 l = 0.825 KG)

Tanks 1 and 2 :	29696 KG = 35995 l
Tanks 3 and 4 :	29696 KG = 35995 l
Tank 5 left and right :	6521 KG = 7912 l
Tank 6 :	16829 KG = 20400 l
Tank 7 :	4126 KG = 5002 l

Fuel tank quantity and fuel flow can be controlled by gauges at the overhead panel (Shift-4)



86 : Fuel Flow Engine 1 (all in KG/hour)	87 : Fuel Flow Engine 2
88 : Fuel Flow Engine 3	89 : Fuel Flow Engine 4

The big arrow shows the Fuel Flow. The small arrow integrates loaded fuel for the engine. In the beginning of flight it is exposed to the fuel weight regarding that corresponding engine (total / 4). A clickspot on the yellow center conveniently sets the actual value. In flight from that Fuel Flow 'charge' gauge, the fuel quantity will decrease by the fuel weight used by that engine.

90 : Fuel Quantity Tank 5 Left (all in KG)	91 : Fuel Quantity Tank 1 and 2
92 : Fuel Quantity tank 6 and Summary (except tank 7)	93 : Fuel Quantity Tank 3 and 4
94 : Fuel Quantity Tank 5 Right	95 : Fuel Quantity tank 7
96 : Fuel Quantity control switch (at KONTR position indicates zero at all gauges)	

Fuel tank operation (Shift-8)



97-104 Fuel Pump/Swapping switches :

From left to right :

- 97 : Tank 5 left
- 98 : Tank 1
- 99 : Tank 2
- 100 : Tank 6
- 101 : Tank 7
- 102 : Tank 3
- 103 : Tank 4
- 104 : Tank 5 right

For the main tank 1, 2, 3 and 4 the fuel pumps MUST be turned on, additionally signalled by the RED lights going OUT when pumps are turned ON.

Fuel pump activity of tanks 5, 6 and 7 is signalled by green lights. Those turn off again if tanks run empty.

105-107 Crossfeed Switches for corresponding tanks.

The fuel system works fully automatic in all flight phases and normally does not demand intervention. Only those fuel pump switches of tanks containing fuel should be turned ON.

The flight engineer should just monitor the fuel system activity during flight. If tanks 5,6,7 run empty during flight (can be noticed if green lamps go out), make sure to turn the corresponding switches to OFF.

Fuel Jettison (Ctrl-Num8)



In case of emergency for whatever reason or should it be necessary to reduce weight for getting below the maximum landing weight, all fuel down to a minimum reserve of 10000 l can be jettisoned. Fuel jettison take place separately for each half of the wing, fuel being transferred to the atmosphere at the wing tip fairings.

Fuel dumping from tanks 5 and 6 can be done completely, while for the main tanks 1 to 4 the above mentioned 'undumpable' reserve of 10000 l is automatically ensured. Fuel drain from tanks 5 is made through dump tanks corresponding to them. Fuel drain from tank six is made through the main tanks, thus only the fuel pumps for this tank must be turned on. Tank 7 can also be jettisoned completely, fuel is transferred to the atmosphere at the right side of the rear fuselage.

Procedure to jettison fuel :

1. Fuel pumps of tanks 5 left, 6 and 5 right must be turned on (see Panel of fuel pumps, Shift-8)
2. Open the cover of the fuel dump panel (right mouse button, clickspots on lower part of panel cover).
3. Turn the main dumping switches 115 and 121 on.
4. Open dump valves of tank 7 (122) and 5 left (116) and right (120)
5. Open fuel dump pumps of tanks 1, 2, 3, 4 (117 and 119)
6. Use fuel quantity gauges (shift-4) to supervise activity of the system
7. If tank 7 is empty, turn off dump valve (122) and fuel pumps (101) of this tank
8. If tank 6 is empty, turn off fuel pumps of tank 6 (100)
9. If tanks 5 are empty, turn off dump valves (116 and 120) and corresponding fuel pumps (97 and 104).
10. After full fuel dump down to the minimum, turn off main tanks dump valves (117 and 119)
11. Finally turn the main dumping switches 115 and 121 OFF.

In the real plane, a full fuel dump procedure for tanks 1 to 6 takes approximately 40 minutes. For tank 7 it needs 17-20 minutes.

1.5. GPS KLN 90B



Please refer to the Project Tupolev Forums and the real KLN-90B Operating Manual for further information to operate this unit.

1.6. Weather Radar Groza



- a) main power supply (RDS)
- b) PRD I – PRD II transceiver selector switch
- c) Range knob
- d) Inclination knob
- e) STAB Mode on/off switch
- f) Mode selector
- g) Brightness / Contrast Regulator

General description

The implemented PT GROZA weather radar represents a pulsed RADAR of a three-centimetre wave band with aerial scanning in the azimuthal plane. The radar can work in the modes 'Standby', 'Ground', "Mereo", "Contour" and "Drift", selectable by the corresponding mode switch..

1. **The mode "standby"** is auxiliary. In this mode the Radar is connected to the aircraft electrical system without activation of high pressure of the transmitter, but it is in operational readiness.
2. **The mode 'ground'** is the Air-to-ground mode and displays a radar representation of the ground.
3. **The mode "Mereo"** is used for obtaining a display of actual air conditions. It can contain reflections from various airborne moisture targets in the atmosphere: thunderstorm fronts, areas with increased motion turbulence of air particles, vortex generations and other phenomena. In the mode "Mereo" a narrow directional diagram is used on all scales. If an image is desired under different angles, the antenna pattern can be manually inclined relative to the airplane horizontal axis up to 10 and down to 15 degrees (at simultaneous preservation of gyrostabilization functionality).
4. **The mode "Contour"**. In this mode the crew estimates a degree of danger of flight into a detected zone of thunderstorm activity or cloud cover by planimetric indication. The capability of allocation of dangerous zones is based on the fact, that the signal strength reflected from them is much higher than the signal strength reflected from harmless zones. Strong signals corresponding to dangerous zones are suppressed, on their place there are the dark contours contrastly allocated on a light background, formed by reflections from harmless zones.
5. **The mode "Drift"**. Serves for measurement of airplane drift angle for the default DISS-013 Doppler system, to be used for navigation purpose.

Activation, functional check and operation of RADAR in flight

- switch "ПРД I-II" (b) – in position "I"
- switch "Стаб. - Откл." (e) – in position "Стаб"
- mode switch (f) – in position "standby"
- range knob "Масштаб км" (c) – in middle position
- inclination knob "Наклон" (d) – 10 deg upwards
- regulators "Brightnesses", "Contrast", "Labels" (g)– as desired

Operation of the RADAR

1. Press "PJIC" on the control panel , thus should display integral lighting of control panel inscriptions and a light-emitting diode for activation of standby mode should be visible.
2. After 3-5 minutes set the mode switch to position "Mereo". Thus the lighted diode for "Mereo" mode activation should be lighted. Use the handles for Brightness and Labels to adjust the luminous rings to the desired brightness.
3. Check activity of the range regulator " Масштаб км " by slowly rotating it from an extreme right position to extreme left. The quantity of range rings which should look close to a ring with approximately identical distances between rings, should change smoothly. At extreme left position of the range regulator, the range rings are absent. At extreme right position of the regulator four rings through 25 km, two subsequent through 100 km should be displayed. Check quantity of rings on azimuth angles 40-5° or 310-320°. On scales over 200 km reduction of brightness of rings is supposed.
4. Set the Inclination knob to position 5°.
5. Set minimal brightness of the radar image and by rotating the Contrast knob make sure the character of the radar image on the display changes. Occasionally that might not happen, but near to extreme right position of the Contrast handle the bright elements of the radar image will decrease.
6. Set the mode switch to position "Contour". In this mode inside bright images of thunderstorm zones and rain cloud covers (at their presence), the blacked out regions of dangerous thunderstorm cells should be allocated.
7. Set the mode switch to standby, set the transceiver switch "ПРД I-II" to the standby transceiver by using the position "II" and repeat checks as mentioned above.

For flight, the mode switch should remain in standby position until after takeoff. Except in poor visibility, then it is possible to set the Meteo mode with a scale of 50 KM before take-off . Thus the Radar will 'look' through the space with a narrow beam in the direction of motion.

Depending on flight conditions, the mode switch can be set to one of the following positions: "Ground", "Mereo", "Contour", "Drift".

If during any period of flight the radar is not used, it is necessary to set the mode switch to the standby position.

1.7. Copilot Panel



The Copilot Panel can be opened using CTRL-NUM3 and closed using the Spacebar (returns to the main Captain panel).

The right side of the Copilot panel contains gauges already described for the Captains panel. It should be noted Copilot ADI and HSI can be controlled separately from the Captain ADI and HSI. At the right of the panel there's an additional Pitot Heat and a power switch for the Copilot Radio altimeter.

Copilot ADI and HSI can also be opened separately from the Captains panel using Shift-5 !

The left side of the Copilot Panel contains engine gauges :

- 130 Engine rpm indicator , high and low pressure compressor stage rpm
- 131 EGT, Exhaust Gas Temperature
- 132 Oil quantity, Oil pressure and Oil temperature
- 133 Throttle Lever Angle (TLA)

1.8. Navigator Panel and Subpanels



Subpanel Clickspots :

- A KM-5 / Standby ADI Selector
- B TKS Panel
- C Virtual Navigator
- D INS I-21 Panel
- E Magnified Upper Panel (use to operate ADF and P31-4 unit)
- F Navigator Scenery Window
- G VOR/DME Panel

200 KM-5 correction unit.

This Magnetic Correction gauge does not demand any attention. Experienced users might observe it in flight, it is quite interesting. Especially at high latitudes. At a turbulent weather. At turns on headings close to 0 or 180 degrees. During takeoff on map angles close to 90 or 270 degrees. After such supervision you will understand, why in real operating manuals for different airplanes the transfer of a compass system to the magnetic course of the arrival runway is recommended to be made by input of beforehand designed correction, instead of coordination on the magnetic sensor.

Using clickspot A at the upper left panel, the KM-5 can be replaced with a standby ADI.

Using Clickspot E, the upper part of the panel can be magnified, necessary for operation of the ADFs (201, 202) and NV-PB unit P31-4 (203)

- 201 ADF 1 Unit
contains active and standby frequency, selectable with Channel (Kanal) 1/2 switch. Unit must be turned on by setting switch at upper right to the KOM position.
- 202 NV-PB Programming Unit P31-4
- 203 ADF 2 Unit
contains active and standby frequency, selectable with Channel (Kanal) 1/2 switch. Unit must be turned on by setting switch at upper right to KOM position.
- 204 RSBN Channel Selector Unit
Set Channel numbers using +/- clickspot
- 205 DME 2 indicator
- 206 Wind indicator (shows direction and speed)
- 207 RSBN or VOR Azimuth and Distance Indicator
- 208 IAS Speed indicator
- 209 TAS/Groundspeed indicator (selectable with button on lower part)
- 210 metric altimeter
- 211 vertical speed indicator
- 212 Radar Altimeter
- 213-215 NV-PB Waypoint Set 1 (Heading OZMPU, Deviation Z, Distance S),
Blocks P-12, P-2, P-3
- 216-218 NV-PB Waypoint Set 2 (Heading OZMPU, Deviation Z, Distance S),
Blocks P-12, P-2, P-3
- 219, 220 Waypoint Input Units P6 and P7, either X, Y coordinates or Z,S values
- 221 DISS/SVS Source switch and Overwater Correction Switch
- 222 RSBN Correction Unit P-9, Map Angle (IZPU) Input
- 223 RSBN Correction Unit P-10
- 224 RSBN Correction Unit P-8, Deviation entry
- 225 RSBN Correction Unit P-7, Distance entry
- 226 Navigator Gauge USH-3
- 227 Navigator Gauge KUSH-1

A button on the bottom left serves for fast agreement. A selector on the bottom right should be left in position MK, according to operating manual the other positions are not used.

- 228 UWDB-1, shows VOR or ADF pointers (depending on selector 230)
- 229 Navigator signal light indicators
- 230 VOR / ADF selectors for gauge 228
- 231 USH-3 Index Selector
- 232 NV-PB control unit
- 233 yes, it's a clock ☺

TKS Subpanel



- 240 Light signal and power supply for the reserve gyrohorizon АГБ-3. At turned off onboard generator feed the gyrohorizon is automatically switched to battery power. That can also be accomplished using the switch. The board shows, from which source the reserve gyrohorizon consumes.
- 241 OAT - Outside Temperature Indicator
- 242 BDK-1 Unit
- 243 TKS PU-11 Unit
- 244 3K-4 Unit

VOR/DME Subpanel



- 245 DME Unit 1 (power supply at the left of scale must be turned on !)
- 246 DME Unit 2 (power supply at the left of scale must be turned on !)
- In the real plane these devices allow setting of individual DME and VOR frequency. For FS, the frequencies are synchronized.
- 247 VOR (Course MP) Unit 1
- 248 VOR (Course MP) Unit 2
- 249 Audio IDENT Panel
- 250 KM-5

INS Subpanel



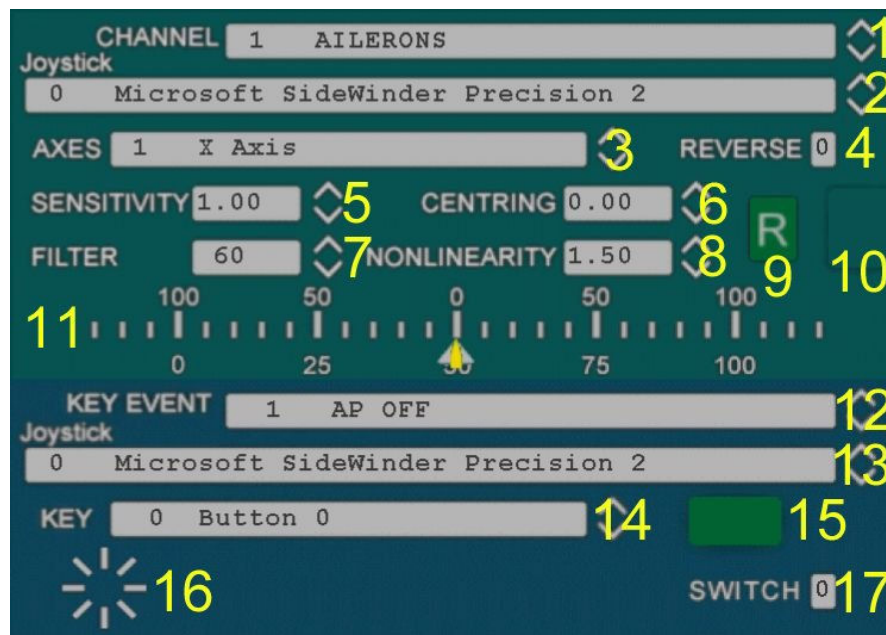
- | | |
|---|--|
| <ul style="list-style-type: none"> 251 INS 1 Mode Unit 253 INS 1 Main Unit 255 Active Navigation System Selector | <ul style="list-style-type: none"> 252 INS 2 Mode Unit 254 INS 1 Main Unit |
|---|--|

2. Hardware Setup, Load and Fueleditor and miscellaneous features

2.1. Joystick Service Device

Joystick setup

This release requires a special handling of input devices. The joystick control system in FS 2004 doesn't make it possible to simulate many special control features of the airplane. As a first step, the Joystick in FS 2004 MUST be disabled either from the menu or using CTRL-K



The panel of the service device shows two colour zones, one zone for the setup of Joystick axes, the other zone for the setup of buttons.

From top to down the following fields can be found (with +/- mouse clickspots to the right of several fields !):

1. Window of number and name of the chosen control channel. The channel number is the reference information.
2. Number of Joystick in the system and corresponding name (derived from the Joystick driver)
3. Number and name of the chosen axis.
4. Axis inversion box (0=no, 1=yes)
5. Sensitivity input (allows changing the range of control input)
6. Centering input (allows displacement from the neutral position)
7. Filter input (filters lower frequencies and therefore contributes to noise elimination and introduces a control displacement delay)
8. Nonlinearity input (adjustment of dead zone)
9. Lighted button for reading a configuration.
10. Lighted button for writing a configuration The write button is closed by a cap, opened with the right mouse button.

Unsuccessful reading and writing is caused by absence of a folder
... \Gauges\Il62_cfg\JOY in which the configuration file joy.cfg is stored

11. Joystick movement indicator. The yellow indicator shows the Joystick deviation – the white indicator the control displacements of the chosen channel. The upper scale is intended for setup of control surfaces, while the lower scale shall be used for functions like throttle and brakes.
12. Number and name of the chosen button function.
13. Number and name of the Joystick
14. Number and name of the button. For convenience, the hat switches are submitted by a button set.
15. Test light of the chosen button
16. Indicator of the chosen Hat switch .
17. Input window for switch attribute

Some features of set-up of channels.

Throttle control levers.

For activation of reverse at throttle lever zero position, the white indicator should be in the negative area. The offset value depends on Joystick noise. For thrust levers it is advised to set a big filter factor.

Brakes.

Setup of brakes with Joystick axes is possible as setup of each brake with a separate axis and also as one axis for both wheels. At set-up of brakes with one axis, differential braking is provided. At more than 50% movement one wheel is disconnected.

Differential braking is also implemented for button

The configuration file :

The Joystick configuration is automatically stored in the file FS2004 \Gauges\Il62_cfg\Joy\joy.cfg at the first record of a configuration.

The switch attribute setting

This attribute is entered for distinction of "buttons" and "switches", necessary for home cockpit builders. The attribute works only on push button functions where it makes sense.

At the installation of an attribute the device treats the button as a switch. At the pressed button the switch is established in one position, at released button – in another position. Example : If you include this attribute for the button “reverse”, then the reverse function will be activated by pressing and holding the button . At button release, the reverse function will be switched off and thrust levers placed in idle position.

Three-position switches are modelled by two buttons. For both buttons it is necessary to set switch attributes. If no button is pressed, the switch is in neutral position. Example : One button switches landing lights, the another button switches taxi lights. If no button is pressed, lights are switched off in neutral position.

Joystick SETUP procedure

The setup is quite simple and should be done as follows :

Joystick axes

1. Choose the aircraft control “channel” (e.g. aileron, elevator, rudder, throttle1,2,3, etc.) in window (1). Use the +/- mouse clickspots to the right of the field to select the channel.
2. Check or choose the Joystick in your system (in case you have more than one, e.g. separate yoke, throttles, rudder) in window (2)
3. Choose the Joystick axes for the chosen control channel (e.g. X-Axis for aileron, Y-axis for elevator) in window (3)
4. In you observe unwanted inverse movement, set the reverse function (window 4) to the value 1.
5. Check the correct choice by moving the corresponding Joystick axis and observing movement on the indicator (11).
6. For each axis, set Sensitivity, Centering, Filter and Nonlinearity in the fields 5-8
7. Store the setup for this axis using the write button (10), open the cap with the right mouse button first !
8. Proceed with the next aircraft control channel (jump back to step 1).
9. Beware : There are three definable throttle axes for the three engines ! If you have just one slider for the throttle, you need to store it separately for the Channels Throttle1, Throttle2 and Throttle3 and Throttle4 !
10. And once again, don't forget to store your axis setting if you are confident with one axis definition !

Joystick buttons

1. Choose the key event (button function) in window (12)
2. Check or choose the Joystick in your system (in case you have more than one, e.g. separate yoke, pedestal or other controller) in window (13)
3. Choose the key code suitable for that button. Change it in window (14), press the corresponding button and observe lighting up of the test light (15). If it does, you found the correct code number.
4. Store the setup for this button function using the write button (10), open the cap with the right mouse button first !
5. Proceed with the next button function/key event (window 12), until all buttons are correctly defined.
6. And once again, don't forget to store your button function each time you are confident with one definition !

2.2. Load and Fueleditor

The screenshot shows a software interface for managing aircraft load and fuel. It consists of several sections with labels and numerical input fields. The first section contains 'TOTAL WEIGHT' (175279), 'FUEL WAIGHT' (86275), and 'CG POSITION' (34.9). The second section contains 'LOAD WEIGHT' (19999) and 'LOAD POSITION' (4.28). The third section contains 'TANKS 1 - 4' (58798), 'TANKS 5L - 5R' (6520), 'TANK 6' (16829), and 'TANK 7' (4126). The labels 'FUEL WAIGHT' and 'mosue' in the text are likely typos for 'weight' and 'mouse' respectively.

TOTAL WEIGHT	175279
FUEL WAIGHT	86275
CG POSITION	34.9
LOAD WEIGHT	< 19999 >
LOAD POSITION	< 4.28 >
TANKS 1 - 4	< 58798 >
TANKS 5L - 5R	< 6520 >
TANK 6	< 16829 >
TANK 7	< 4126 >

All fields denoted with an '<' and '>' symbol can be changed using the corresponding mouse clickspot. Use the left mouse button for fine and the right mosue button for coarse changes.

Loading and refuelling.

One of the unique features of the Il-62, not having an analogue in any other airplane of the world, is that the airplane empty weight center of gravity is behind of the position of the main landing gear. Therefore before starting loading and refuelling of the airplane it is necessarily to extend the tail support of the landing gear if it is not extended already. Otherwise tumbling of the airplane on the tail is quite possible. Though it's not fatal (the tail support even in retracted position will prevent damage to the plane), it's not desirable. We will not win the pilot-of-the-month award with an airplane sitting on the tail. The tail support is operated with the mouse on the buttons УБРАНА and ВЫПУЩ at the right lower corner of the Captains panel.

We "drain" all fuel from tanks. In the main tanks 100 kilogram will remain. It is possible to skip fuel draining, but for the first time it is recommended to understand the loading process. A normal procedure is to refuel the airplane first and then load passengers, but for understanding of some features of the airplane center-of-gravity position I will explain it one time the other way round.

We load the payload, not forgetting the doors shall be open to do this (how should we change payload with closed doors ☺ ?). The maximum payload for the Il-62 equals 23 tons. We select a weight position that leads to a zero fuel center-of-gravity position within the limits of 30 – 34 %. The center-of-gravity range for the airplane is 28–34 %, but fuel shifts the center-of-gravity position forward, therefore less than 30 percent zero fuel center of gravity position is not recommended. At the moment the process of freight accommodation is not completed, in particular there are ambiguities with tank coordinates. Therefore probably some discrepancy to the real center-of-gravity position might exist..

We continue to load fuel as needed, first in tanks 1-4. These are the main tanks, from there the engines are feeded, and the number of the tank corresponds to the engine number which is feeded. From other tanks the fuel is transferred by pumps and gravity flow to the main tanks. During refuelling we do not exceed the maximum takeoff weight of 165 tons. Take the maximum landing weight of 107 tons into account, so you don't have to jettison that much costly fuel.

After loading and refuelling the center-of-gravity position should be within the limits of 28-34 %.

2.3. Miscellaneous

TCAS

The actual TCAS does not correspond to the version implemented on Il-62M airplanes, it is connected to the TCAS model developed for the Tu-154B2 model.

The screen of the device has a small scale, for more detailed studying of certain situations you can click on the gauge to get an additional indicator with bigger size. This indicator will automatically appear at occurrence of dangerous conditions. It is possible to suppress the automatic appearance of the additional indicator in the TCAS configuration file (tcas_iva_dop_ta=0).

Some airplane features

The airplane has unpowered manual control. Trim is implemented using stabilizer, manual and electric elevator trim tabs. Practically the airplane is trimmed with the stabilizer, elevator trim tabs remove small residual efforts. Therefore buttons for stabilizer rearrangement of the stabilizer are primarily necessary to define as Joystick buttons. The electrotrim tab is only used with active autopilot for automatic trim. The compression switch of an electrotrim tab is used for returning electrotrim tab in neutral position at a disengaged autopilot.

If the elevator is rejected within five seconds on a angle more than 3 degrees, the board ПРОБЕРЬ ПОЛ. PB lights up. At manual control you use should stabilizer trim to return elevator deflection to the zero position. If the board will light up at active automatic control of stabilizer rearrangement, do not hurry up, in three seconds the automatic control unit will react and balance the airplane (reaction time of the board – 5 sec, АПС – 8 sec). The control of balancing can be done using the indicator of control efforts ИИ-3 (at the left side of the Captains panel). Before autopilot disengagement it is useful to look at this indicator, with it you define the airplane behaviour after autopilot disengagement.

Saving / Loading a flight

Using the standard simulator 'Save flight' feature also non FS standard equipment is saved additionally. This included Autopilot setup, NV-PB Navigation mode, virtual navigator, I-21 and fuel system state. The actual condition of the KLN-90 is not saved. Due to long engine spool-up times it is not recommended to save the flight on the glideslope, with active autopilot modes V and M or with NV-PB in the main orthodromy mode.

It is recommended to use the 'Save flight' feature from the Captains Main panel with all subpanels closed. !

3. Basic Flight data

We have two engine instruments on the main Captains Panel. The upper gauge shows your high and low pressure compressor stage rpm, in Western terminology N2 / N1. For the Il-62, we use the Russian terms KBД and KHД. The second gauge shows your Thrust lever angle in degrees (TLA in english terms, УПІТ in Russian).

Maximum Take-off weight 167 tons

Takeoff Power :

KBД = 96-97 % KHД = 87-90 % , УПІТ (approx.) = 110-113 deg.

At take-off weights less than 140 tons you can use climb power for takeoff.

After takeoff retract flaps in two steps (15, 0) and accelerate to 570 km/h

Climb Schedule : 570 km/h / 0.78M

Climb Power (in Russian terms : Nominal mode)

KBД = 93-95 % KHД = 82-85 % , УПІТ = approx. 100 deg.

Maximum cruise altitude at different weights :

165 t - 9 600 m;

157 t - 10 100 m;

141 t - 10 600 m;

126 t - 11 100 m;

115 t - 11 600 m;

109 tons and less - 12 100 m.

Typical cruise speed 0.80M, in turbulent conditions .77-.78M

Maximum cruise speed : 0.82M

Descent :

Idle Power at e.g. 11 100 m

KBД = 81-83 % KHД = 68-70,5 %

Idle Power at 1 500 m

KBД = 62-65 % KHД = 42 %

At a circling altitude e.g. 800m, Weight 107t

Power is set using УПІТ

horizontal flight, clean wing :

УПІТ (approx.) = 46 deg.

KBД (approx.) = 75-78 % KHД = 51-54 %

horizontal flight, clean wing, Speed 380 km/h, gear down :

УПІТ around 50 deg.

KBД (approx.) = 82-85 % KHД = 58-60 %

horizontal flight, flaps 15 deg., Speed 340 km/h, gear down :
 УПІТ = 54 deg.
 КВД (approx.) = 83-85 % КНД = 60-62 %

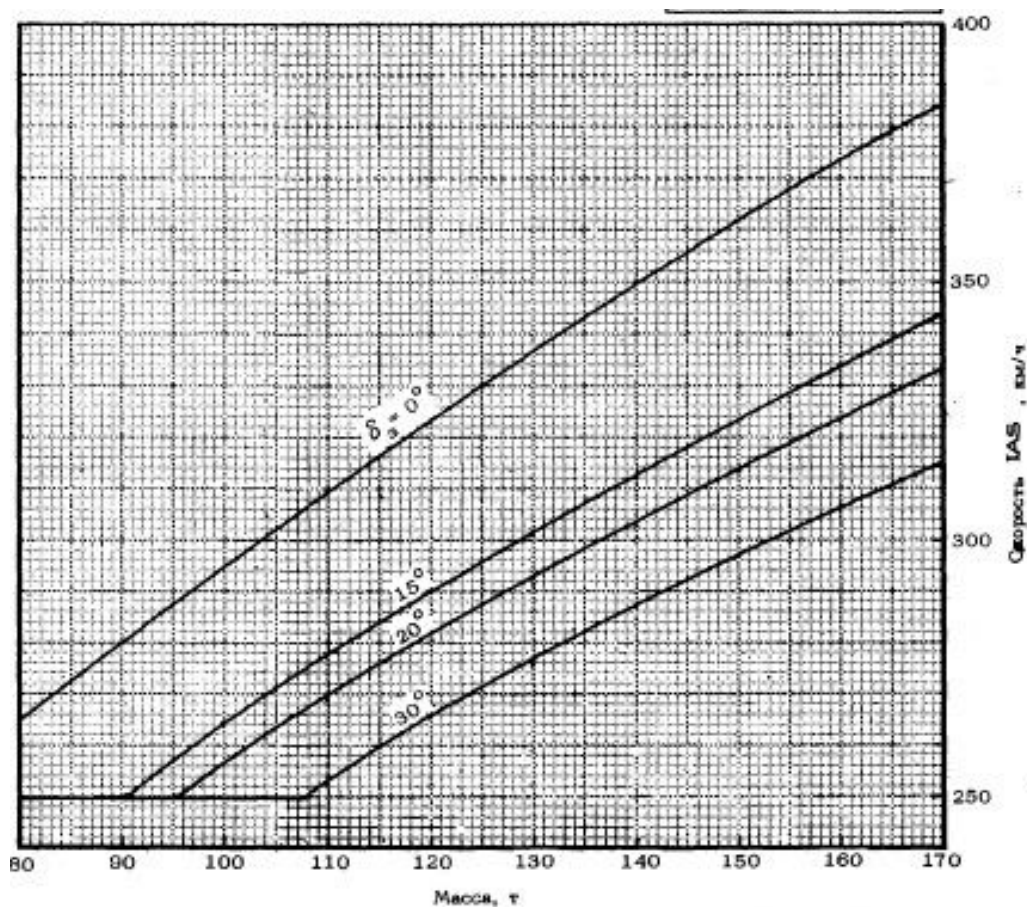
horizontal flight, flaps 30 deg., Speed 290 km/h, gear down :
 УПІТ = 56-58 deg.
 КВД (approx.) = 86-88 % КНД = 64-66 %

Maximum landing weight, stabilized on Glide path, Speed 280 km/h : УПІТ approx. 44 deg.
 In gusty weather add 10 km/h. For lower landing weights, correspondingly subtract up to 10 km/h.

Basic fuel consumption :

Climb Sea Level to 9600m, Maximum takeoff weight : 4300 t
 Climb Sea Level to 9600m, Takeoff Weight 150 t : 3200 t
 Cruise : 2000 – 2200 t/hour depending on weight

The following diagram shows takeoff speeds (Y-axis, in km/h) for various Flap angles at different weights (X-axis ,in tons)



4 Tutorials

4.1. Airplane system preparation

To get the Il-62M in cold and dark state, load the default Cessna first, turn engines, Master Switches and Avionics off. Then load the PT Il-62M.

Make sure your hardware setup is defined in the Joystick service device and the plane gets loaded according to your intention using the Load- and Fueleditor.

The order of operations in the given description does not intend to be conform to the real operating manual for now.

1. Turn on the Batteries (Akkumulator) with Switch 41 on the main Captain Panel.
2. Click on the button in upper right corner of the Standby ADI (АГБ-3).
The gyro horizon should be established to zero for pitch and bank.
3. Press the red button-lamp of the main Captains ADI and hold until the gyro horizon will show non-zero pitch and bank.
4. The same it is made in the co-pilot panel . Possible from the complete Copilot panel or using the seperated Copilot ADI and HSI gauges with Shift_5
5. Test the various signal light systems using the corresponding test switches (e.g. 22) below the units
6. Open the Captains left panel with Shift_1. Press and hold the button ИГБ КОНТ for 10 seconds (better more than less). After releasing the button the light signal ИГБ КОНТ on the corresponding signal board should go out. Thus we have agreed all three vertical gyros.
7. On the left panel, turn on both radio altimeters PB-5M (switch 46 to the left!). In the same place the toggle-switch of pitot heat ППД (for convenience it is placed here, not so on the real plane) is located. The airplane is equipped with two radio altimeters, the navigation officer has a duplicate of the Copilot radio altimeter.
If you forget to turn on the Radar Altimeters, you'll get a warning sound when descending.
8. Turn TCAS on with the right mouse button on the left knob of the TCAS board. All other manipulations on the TCAS panel are made with the left mouse button. We set the mode TA/RA.
9. If control of the nose gear (light signal ДАВЛ.ПОВОР does not burn) is not active, turn it on using switch (50). The left panel can be closed now.
10. Next step is the compass system agreement. The airplane silhouette of the USH-3 instrument (226) always shows the heading from the main gyroscopic unit, the arrow shows the track angle. The heading from a monitoring gyroscopic unit is always given on

the airplane silhouette of the KUSH-1 instrument (227, the combined index of the Navigator), located more to the right of the USH-3. The arrow on the KUSH-1 shows the magnetic heading. The Il-62 course system has one magnetic course channel. Contrary to the Tu-154, the magnetic heading coordination is made with the button on the KUSH-1 (in the lower left corner of the device). Depending on the toggle-switch position, the index on the USH-3 indicates the heading from the monitoring gyroscopic unit or the current track angle of the NV-PB navigation system.

The entire agreement procedure works as follows :



1. Open the TKS panel using the clickspot B on the Navigator Panel
 2. Set the Mode selector (d) in position MK.
 3. Press and hold the fast agreement button (g) for both positions of the correction switches (e) OCH and KOHTP.
- Up to here, it's similar to the Tu-154.
4. Now put the mode selector (d) in position ГПК
 5. Press and hold the button on the KUSH-1 gauge (227)
 6. Leave the selector in position ГПК
 7. Set your current position latitude in the TKS (knob b for Latitude scale at a)
11. After turning on the corresponding units, set the desired navigation aids (RSBN, ADF, VOR) as desired. Set the Runway ILS frequency, turn the Autopilot power supply ON and set Runway heading using the big outer ring on the Autopilot panel.
 12. Preset your circling altitude, initial clearance altitude or cruise altitude on the digital altimeter. Later you will get an acoustic reminder to level-off when you get close to that altitude.

13. Open the fuel system control panel (Shift-8). Turn all fuel pumps on (up to 16, see where the red lamps burn). Red lamps should go out and we can close the panel. We open the fuel panel (Shift-4) and set the fuel content on the flowmeters to the rate of the general fuel contents divided by four. If you are lazy, you can click with the mouse on the yellow center of the flowmeters, then all will be set accordingly.
14. Turn the position and beacon light on, the latter signalling upcoming engine start. Make sure the throttle levers are in idle position, not in the lowest (cutoff) position.
15. After or during pushback the engines can be started (Ctrl-E)
16. Continue take-off preparation. On the upper panel the light signal board for control is located. It executes approximately the same functions as the board “К ВЗЛЕТУ НЕ ГОТОВ” (not ready for takeoff) on the Tu-154. Extend the flaps to 30 degrees, remove the tail support, retract parking brake and set the stabilizer in take-off position. This position is calculated depending on weight and center-of-gravity position and should be approximately 6 degrees. The ‘not ready before takeoff’ light signal should go out (if the parking brake is off).
Extend the headlights and turn the taxi light ON.
16. Open the fuel system control panel, include the crossfeed pumps of tanks 5 and 6 and open the valve of tank 7, if applicable. Of course this is only necessary at presence of fuel in the corresponding tanks.
17. Taxi to the runway, before lineup turn the landing light on and include the rear strobe light.

Ready for takeoff. To get used to the unique plane features and just to enjoy the flight feeling, I recommend several manually flown airport circuits. Learn your aircraft, get used to its characteristics before you attempt further steps.

Just make sure not to exceed the maximum landing weight, so for a short circuit reduce the takeoff weight accordingly. Do NOT use the standard FS fuel menu ! Should you want to dump fuel to get below the maximum landing weight, you must use the IL-62M Fuel Jettison Panel, even if the fuel dump process takes some time.

After practice of manual flight, I recommend to do the same circuits using the Autopilot as described in the Autopilot Chapter. Use AP/AT Disconnect before landing and flare the plane yourself and practice full Autolands with and without crosswind and learn to initiate and master the GoAround procedure.

In the next tutorial you'll learn to use the unique Standard Maneuver Mode (rectangular Approach pattern) of the IL-62M.

4.2. Airport Circuit, Standard Maneuver Mode (rectangular Approach pattern)

The following tutorial explains the famous rectangular approach pattern mode of the Il-62M, which allows to fly an automatic pattern, either left or right. The pattern to fly is outlined in the P31-4 programming unit with the yellow rectangle (left pattern) or blue rectangle (right pattern).



The numbers and lighted buttons inside the rectangle represent the following legs :

- 0 runway heading(if in takeoff position, that is also the starting point)
- 1 runway heading
- 2 270 deg + runway heading (left pattern) or 90 + runway heading (right pattern)
- 3 180 deg - (-runway heading)
- 4 90 deg - runway heading (left pattern) or 270 deg + runway heading (right pattern)

With '0' the center of the pattern display is meant. The active leg is also outlined by yellow lighted arrows.



Ok, let's go. We will takeoff from and land on the same runway, so just choose any runway as desired. Establish the plane in takeoff position. All coordinates we will see on the NV-PB counters are relative to this takeoff position. Axis Y along runway direction, Axis X to the right.

On the NV-PB control panel P-14 turn power supply a) to ON, set the mode switch i) to ГО and turn the switch 'KP' ON (c)



On the Navigator panel, you will notice one set of units P12, P2 and P3 with yellow lighted inscriptions. Now on the other P-12 unit, where the inscription does NOT burn (that's the inactive set), enter the runway heading using the arrows and corresponding clickspots on the P-12. A tooltip will assist setting the exact value.

Now on the P-14 turn the switch ЗИП to ON (b). On the P31-4 unit, set the switch (c) to the upper position for standard maneuver ("**Стандартный маневр**") and with switch (b) use the pattern direction. Upper position is for left pattern, lower position for right pattern.

Check if the X and Y values on the units P2 and P3 indicate zero, include the notation on the P14 unit with Switch (h) to upper position and takeoff. After climb to circling altitude turn the autopilot On and activate Altitude Hold Mode.

On the P31-4 turn on switch a) to the upper position "посадка" (means "landing"). Now press the combined button and lamp below the seven. Select and activate the autopilot in navigation mode. The plane will continue on the runway heading.

At a desired distance from the runway press the button of the second turn (button lamp '2). The plane will turn a heading perpendicular to the runway heading. Check the counter P-2 with the X-indication when the turn is completed, that will give you an idea of the turn radius at the current speed. It is useful for the final turn to initiate a really rectangular pattern. However, continue looking at the counter P2 with the X indication and at the desired moment press the button of the 3-rd turn. The plane will turn to a heading opposite o the runway heading..

And again at the appropriate moment press the button 4 to initiate the fourth turn.

By the way, in Russia a circuit is classified by naming the number of turn (e.g. 3rd turn, 4th turn), not by naming the legs (such as downwind or base leg).

Please note, at all these actions the lateral deviation counter Z shows always a value of zero. The autopilot only puts the plane on the necessary heading. The size of the box is defined by the moments of button pressing of the button and the turn radius.

At necessary moment (you look for the turn anticipation !) press the button 0. This button works a bit different than the others. . If previous button just established the plane on the necessary heading, the button 0 puts the plane on runway axis, it means the Autopilot 'nulls' the coordinate X.

Now aligned with the runway heading heading, just land the plane as you please, either visually or using Localizer/Glideslope intercept.

4.3. Enroute Navigation using NV-PB

This tutorial is an attempt to explain the practical capabilities of the NV-PB Navigation Calculator System with an example flight from Ekaterinburg (USSS) to Novosibirsk-Tolmachevo (UNNT). It's a 1500 KM flight, it will keep us busy during the flight, but will also give some time to breath in between and have a coffee.

The tutorial will contain normal text and additional "EXTRA INFO" text surrounded by a frame, the latter being intended for the experienced users. At the first reading, it is recommended to read the normal text only. The tutorial is intended to demonstrate the capability of the system, it might not be in perfect accordance with real world procedures.

Behind the many NV-PB and related gauges, counters and pointers is a quite difficult theoretical background of navigation, orthodromy and connected facts, which is in detail covered in the english manual of the Tu-152B2 and will only briefly outlined here :

As we all know, the earth has the form of a geoid or a sphere, the latter being a close approximation of the first. If we look at a geographical (or navigation) map, we will quickly notice the meridians change not parallel and converge in the North and coordingly in the South.

Orthodromy is the shortest distance on the earth's surface between two points. It's a straight line, connecting two points on the earth's surface. On the map, which represents a flat projection of our geoid, it will have the form of a curve, convex to the side of pole (we "activate" our three-dimensional imagination!)

For clarity it is possible to represent this convexity in the form of a straight line. Let us connect Novosibirsk and Moscow with a straight line. What do we see? Our route intersects the meridians at different angles. Let us split the route in sections in the quantity of the meridians. Since the course of the aircraft is measured from the northern meridian at each point, let us measure the course (track angle) of each section. Again what do we see? In each section there will be a new track angle! But the line is still a straight line! Hmmm, so to fly the shortest distance we must always calculate a new track angle ?

Fortunately not, some clever brains introduced the orthodromic course.

The basis of the counting starts at the meridian of the departure airfield (it is called its reference meridian) and for the elongation of the entire route, the track angle will be counted relative to it ! With this the track angle will be constant.

Finally we land at the arrival airport. For this it is necessary to lead our compass system to the meridian of the arrival airport. To achieve this we have to add (with sign!) the azimuthal correction (angle of convergence of the meridians). In this case the azimuthal correction is the angle between the meridian of the airfield of takeoff and the meridian of landing airfield. But generally the total declination is equal to the sum of declinations in each waypoint. So finally we have to transfer our compass system and that's it.

The Navigation calculator NV-PB-1 provides:

— Continuous automatic definition of the current airplane coordinates in the great circle coordinate system by a method of route notation;

- Transformation of airplane coordinates at flight in main orthodromy mode relative to entered coordinates of intermediate waypoints; and at flight in waypoint navigation mode relative to the following route segment;
- Flight on the shortest distance in any point of a route;
- Flight on a defined VOR azimuth (not used in the real plane, so also not realized in the model)
- Programming enroute flight with short waypoint distances;
- Programming an intermediate approach for entry to an airport zone with subsequent output on a runway center line;
- Correction of coordinates under data of short range radio beacons: systems RSBN-7 (on RSBN beacons) or systems "COURSE-MP-2" and SDK-67 (on VOR beacons);
- Correction of lateral deviation under data of the system "COURSE-MP-2" (on VOR beacons);
- Definition and indication of values of speed and a wind direction;
- Delivery of heading signals on index of Captain and Copilot HИИИ (HSI) and on USH-3 instrument of the navigation officer;

The calculator receives the following information from other systems:

TKS-P — values of the current orthodromic course;
 DISS-013 — values of ground speed and drift angle in pulse and analog forms;
 SVS-PN-15 — values of true air speed and present altitude;
 RSBN-7 — values of azimuth and slant range relative to ground beacon (for coordinate correction);
 "COURSE-MP-2" — azimuth value from VOR beacons (transmitted through PCBH-7c for correction of notation coordinates); deviation from a defined azimuth of a VOR beacon at flight to or from the beacon, for correction of lateral deviation at flight on a defined azimuth (not implemented in the model, since also not used in the real Il-62M;

Enough theory for now, let's go further. At first we need :

1. An FS Flight Plan of our Route
2. Departure and Arrival Charts of USSS/UNNT.

These can be obtained via vatus.net.ru (look at Downloads/Charts) or <http://www.flightsim.krsk.ru/JEPS/ana/sana.htm>

3. The navigation calculator NCALC, available via the Project Tupolev forums. The current version is http://www.protu-154.com/beta2/NCalc3beta3_Install.zip

Check out the forum at www.protu-154.com/forum for future updates and links.

4. Not mandantory, but recommended : The two gorgeous airport sceneries of USSS and UNNT, available at avsim.ru :

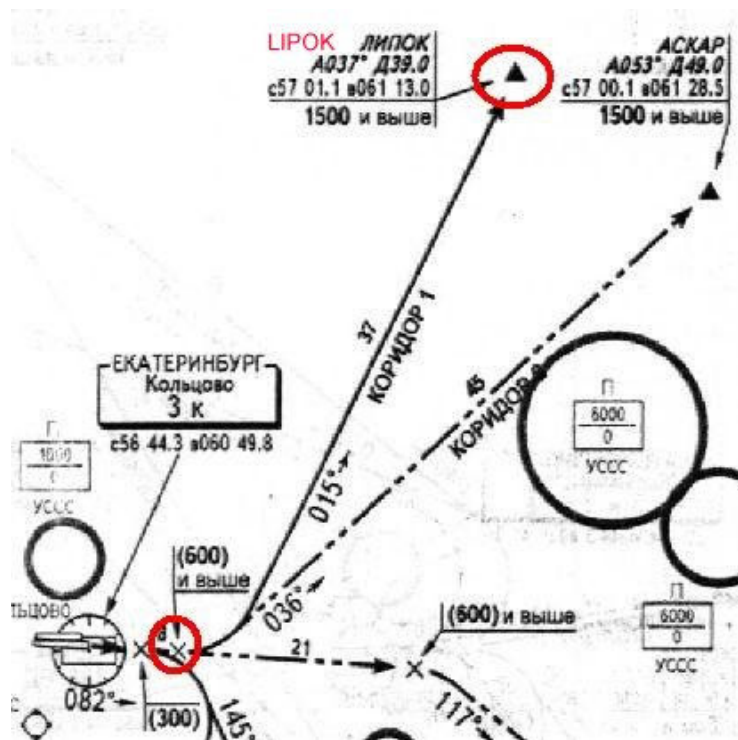
<http://www.avsim.ru/files.phtml?action=download&id=5465>
<http://www.avsim.ru/files.phtml?action=download&id=1961>

Here's a quick summary of our route :

USSS - 08R08 - LIPOK -AR - TALIK - USTR - LEBED - RUBOR - SARNA - ML -
RAVDA - KZ - KENGA - KD - Proc* - UNNT

Or in Airway Notation : USSS / AR2B-LIPOK / DCT-AR / A300-KENGA / B200-
KD / Proc* / UNNT

A quick review of our route : From Ekaterinburg Runway 08R we'll fly output corridor 1 (that's a Russian analogy to the western SID – Standard Departure Route).



On Runway Heading we overfly a point 8Km from RSN Koltsovo at 600m (first red circle), that's the waypoint 08R08 in the flight plan above. Then we turn left to Intersection LIPOK (second red circle) and continue direct to the NDB ARTEMOVSKY (AR) to join Airway A300 to KENGA. From KENGA we continue via Airway B200 to the Initial Approach Fix NOVOTYRYSHKINO (KD), followed by the Approach to UNNT Runway 25.

For the NV-PB-System we need orthodromic headings and distances for the Route itself, we need correction data along our Route and we need so called 'Main Orthodromy' (MO) coordinates for our (optional) departure and arrival route. Furthermore we need the so called 'FORK' value for the transfer to the magnetic meridian of the arrival airport.

All this will be provided by the NCALC Navigation Calculator.

After installation of the Navigation calculator to a directory of your choice, point it to the FS2004 main directory at the first start. This is necessary to read the FS Magnetic Declination file – magdec.bgl. Now use the upper left menu entry ‘ROUTE’ and ‘Import FS*.pln’ to read the FS 2004 Flight plan.

The example flight plan ‘USSS to UNNT (by NCalc).pln’ will be provided at the Project Tupolev Il-62M Support Forum at www.protu-154.com/forum.

View/edit route

Route Name: Dep. airport: Distance, km:
 FL, meters: Dest. airport: Fork:

Points of route

#	Point	Name	MPU	S	RSBN	RSBN name
1	USSS					
2	08R08					
3	LIPOK					
4	AR	ARTEMOVSKY				
5	TALIK					
6	USTR					
7	LEBED					
8	RUBOR					
9	SARNA					
10	ML					
11	RAVDA					
12	KZ	SEVERNOYE				
13	KENGA					
14	KD	NOVOTYRYSHKINO				
15	UNNT					

Route no calculate

Calculate

Point: Add, Change, Delete

RSBN correction: Select RSBN, Delete correction

Service: Print, Export to *.pln, Export to I-21, Export to PSh, Close

From here we can add, change or delete Waypoints (at the Point Section), but all we need for now is to add RSBN beacons we'll use for correction purpose along our route. We'll start with the first correction at the AR NDB, so click on the corresponding line in the flight plan and click the 'SELECT RSBN' button at the RSBN Correction section to the right.

The Calculator will provide suitable RSBN beacons automatically, depending on a useful range. Contrary to the HBY system in the Tu-154, the NV-PB system automatically recalculates slant range in the horizontal, so in the IL-62M we must not follow the 50 KM minimum distance requirement.

We should do the first correction at LIPOK, but we are very busy with other things in the takeoff phase, so for the purpose of this tutorial we skip that. Start with highlighting the AR NDB Line on the flight plan, select a suitable RSBN and do the same for every line in the flight plan up to the NDB KD. Only exception will be the SEVERNOYE (KZ) NDB, for which no suitable RSBN is in range.

You might want to get the same picture as follows :

View/edit route

Route Name: Dep. airport: Distance, km:
 FL, meters: Dest. airport: Fork:

Points of route

#	Point	Name	MPU	S	RSBN	RSBN name
1	USSS					
2	08R08					
3	LIPDK					
4	AR	ARTEMOVSKY			US PU	03k RSBN SVERDLOVSK
5	TALIK				US AT	32k RSBN TYUMEN
6	USTR				US NH	35k RSBN TOBOLSK
7	LEBED				US NH	35k RSBN TOBOLSK
8	RUBOR				US NH	35k RSBN TOBOLSK
9	SARNA				UN LD	07k RSBN OMSK Severny
10	ML				UN LD	07k RSBN OMSK Severny
11	RAVDA				UN LD	07k RSBN OMSK Severny
12	KZ	SEVERNOYE				
13	KENGA				UN KT	24k RSBN NOVOSIBIRSK
14	KD	NOVOTYRYSHKINO			UN KT	24k RSBN NOVOSIBIRSK
15	UNNT					

Route no calculate

Point:

RSBN correction:

Service:

Use the calculate button to (guess what) calculate the entire plan. Confirm the Result of total Distance and the fork value, then use the Service section to the right to **Print** the flight plan.

You can also export data to the I-21 INS (see I-21 description) or export it to a Channel number for later usage in the Virtual Navigator Assistant (Export to NA).

Don' worry about the huge collection of numbers and column labels, you'll quickly learn to extract the important data from the plan. You find the plan printed on the next page with rectangles around the most important data. These are :

OZIMUv Orthodromic heading to next waypoint, valid as long the reference is the departure airport
 OZIMUp Orthodromic heading to next waypoint, valid if transfer to magnetic meridian of arrival airport has been done.
 S Distance to next waypoint
 Sm Distance for RSBN correction
 Zm Deviation for RSBN correction
 Map Angle Map Angle (IZPU) for RSBN correction

Other data :

MD Magnetic declination P_v : current fork
 A_{targ} RSBN azimuth to target D_{targ} : RSBN distance to target
 S_{pas} Distance passed (entire route) S_{rem} : Distance remaining (entire route)

Route USSS to UNNT (byNCalc) (USSS - UNNT)

Distance, km. 1446.9 Fork, deg. 22.6 FL, m. 9600

N	Point	Type	Frequency	Latitude	Longitude	MD	OZMPuV	OZMPuP	S	LPT	Pv	Pp	MPU	IPU	RSBN	Sm	Zm	Map angle	A tang	D tang	S pas	S ren	N
1	USSS	Airport		N56°44.59	E060°48.23	133	082.2	104.8	8.0	10		226	0822	0855							0.0	1446.9	1
2	08R08	Intersection		N56°44.17	E060°56.16	133	075.0	037.6	35.7	0.1	0.1	224	0751	0284							8.0	1438.9	2
3	LIPOK	Intersection		N57°01.10	E061°13.00	133	036.4	058.9	54.8	0.3	0.3	222	0367	050.0	US PU	-928	86	049.7	44.4	93.2	43.7	1403.2	3
4	AR	NDB		N57°20.00	E061°56.00	133	078.9	101.5	110.4	0.9	0.9	216	0799	093.2	03 RSBN SVERDLOVSK	-172.9	89.1	082.3	70.5	186.2	98.5	1348.4	4
5	ARIEMOJSKY TALUK	Intersection		N57°15.90	E063°45.10	134	080.1	102.6	94.9	2.4	2.4	202	0824	085.8	03 RSBN SVERDLOVSK	0.9	0.1	097.2	281.6	0.9	208.9	1238.0	5
6	USTIR	Intersection		N57°10.10	E063°19.10	134	073.5	102.0	97.2	3.7	3.7	18.9	0832	086.6	3X RSBN TYLMEN	60.0	-130.2	089.0	213.7	303.8	1143.1		6
7	LEBED	Intersection		N57°03.50	E063°55.00	134	080.4	102.9	203.9	5.0	5.0	-17.5	0854	088.8	3X RSBN TOBOLSK	-146.0	-131.1	089.9	141.8	196.2	401.0	1045.9	7
8	RUBOR	Intersection		N56°44.00	E070°13.40	132	080.7	103.2	101.4	8.0	8.0	-14.6	0887	101.9	US NH	-248.1	-130.4	100.2	127.9	280.2	604.9	842.0	8
9	SARNA	Intersection		N56°32.10	E071°50.60	130	080.3	102.9	133.4	9.5	9.5	-13.0	0899	102.9	3X RSBN TOBOLSK	11.6	143.1	104.3	9.7	143.6	706.3	740.6	9
10	ML	NDB		N56°15.00	E073°57.00	11.9	061.9	084.5	221.2	12.4	12.4	-10.2	0743	086.2	03 RSBN OMSK Security	-256.4	139.4	085.9	57.3	291.0	839.7	607.2	10
11	RAYDA	Intersection		N56°19.80	E077°32.10	11.1	061.7	084.3	50.8	16.2	16.2	6.4	077.9	089.0	UN LD	-306.6	138.8	085.7	61.4	336.5	1080.9	386.0	11
12	KZ	NDB		N56°20.10	E078°21.80	11.1	061.7	084.3	144.3	16.9	16.9	-5.7	0786	089.7	03 RSBN OMSK Security						1111.8	335.1	12
13	SEVERNOE KENGA	Intersection		N56°19.20	E080°42.10	10.2	106.7	129.3	156.6	10	10	19.7	1265	089.7	UN KT	33.6	7.2	138.3	330.4	34.3	1256.0	190.9	13
14	KD	NDB		N56°17.00	E082°24.00	9.3	120.8	143.4	34.3	22.0	22.0	-0.6	1428	152.1	UN KT	0.1	-1.2	152.3	244.8	1.2	1412.6	34.3	14
15	UNNT	Airport		N55°00.63	E082°39.10	8.9									2X RSBN OMSK Security						1446.9	0.0	15

We're not done with the Calculator yet. To operate the NV-PB system in main orthodromy mode , we also need X,Y-coordinate data for several waypoints close to departure and arrival airport (to define our input and output corridors).

Close the 'View/Edit Route' part and select the menu entry 'Calculating MO'. If active, unselect the entry 'Show only ready for MO' at the upper right, so we get the full list. Scroll down to the Airport UNNT, click Properties and enter the following general data for UNNT and additional data for Runway 07 and 25 by using the 'Add' function.

Transition FL and altitude, ATIS, select the Airport RSBN
Runway designator, frequency of the markers DPRM , BPRM (not needed), ILS frequency, Magnetic heading, Latitude and Longitude of Runway 'butt' end. All other values in the following 'result' picture are calculated automatically.

The 'Airport' dialog box contains the following fields and data:

- UNNT: [Empty field]
- Elevation: 364 ft, 110.9 m
- FL of the transition: 1500
- Height of the transition: 700
- ATIS: [Empty field]
- RSBN: UN KT 24k RSBN NOVOSIBIRSK
- Buttons: Select RSBN, Remove RSBN
- Runways table:

Runway	DPRM	BPRM	ILS freq.	Latitude	Longitude	MD	MC	IZPU	Sm_P	Zm_P
7	310.0	597.0	110.10	N55°00.50	E082°37.40	8.9	72.0	80.9	2.9	-0.3
25	310.0	597.0	108.50	N55°00.80	E082°40.69	8.9	252.0	260.9	0.6	0.3
- Buttons: Add, Edit, Delete, MO points, Close

Now click 'MO Points' and in the enter upcoming window use the 'Add' function to
Note the values IZPU (that's the Map Angle, SmP and Zm_P) in the Runway 25 line, we will need this later for the final RSBN correction in main orthodromy mode.

The 'MO points' dialog box contains the following data:

- MO points table:

ID	Latitude	Longitude
A120_D10.5	N54°58.10	E082°48.60
CH07	N54°59.41	E082°25.23
KD	N55°17.00	E082°24.00
KENGA	N56°19.20	E080°42.10
KT	N55°01.20	E082°44.50
SULIM	N55°07.00	E080°58.00
TBG-25	N55°01.60	E082°48.40
- Buttons: Add, Edit, Delete, From database, Close

...enter all the below listed points with their Latitude/Longitude. If you study the chart at Page 67, you find all those points are needed for the approach to 25.

The Nav aids KD and KT can be selected using the 'From database' function. Since we plan to land at Runway 25, we'll be interested in the rightmost X,Y data pairs. We'll get back to them later.

We have only entered points, which are needed for the Runway 25 approach. If you need data for Runway 07, get a chart and add the needed MO points you need.

Calculation for points of MO

For airport **UNNT NOVOSIBIRSK**

Point		07		25			
		72.0		252.0			
		X	Y	X	Y	X	Y
25(400)	N55°01.60	-0.2	11.5	0.2	-7.9		
	E082°48.04						
A086_D14.0	N55°01.40	1.0	16.8	-1.0	-13.3		
	E082°53.20						
A095_D17.5	N55°01.10	2.1	20.2	-2.1	-16.7		
	E082°56.50						
A107_D16.5	N54°58.30	7.1	18.8	-7.1	-15.2		
	E082°55.90						
A120_D10.5	N54°58.10	6.3	11.1	-6.3	-7.5		
	E082°48.60						
BPRM-25	N55°01.00	-0.2	4.7	0.2	-1.1		
	E082°41.70						
KD	N55°17.00	-32.4	-9.1	32.4	12.6		
	E082°24.00						
KT	N55°01.20	-0.1	7.6	0.1	-4.1		
	E082°44.50						

Two times 'Close' brings you back to the 'Calculating MO' window, if you click 'calculate' you will get the above list we need later during arrival.

We do the same for Ekaterinburg, because we need a few MO points for the Departure :

Airport

USSS

Elevation: 761 ft 232 m

FL of the transition: 1200

Height of the transition: 600

RSN: US PU 03k RSN SVERDLOVSK

Buttons: Select RSN, Remove RSN

Runways

Runway	DPRM	BPRM	ILS freq.	Latitude	Longitude	MD	MC	IZPU	Sm_P	Zm_P
08R	786.0	388.0	109.90	N56°44.54	E060°46.83	13.3	82.0	95.3	3.0	0.2
25L	786.0	388.0	109.50	N56°44.54	E060°49.35	13.3	252.0	265.3	-0.4	-0.5

Buttons: Add, Edit, Delete, MD points, Close

Calculation for points of MO

For airport USSS -

Point		08R		25L	
		X	Y	X	Y
08R08	N56°44.11	-0.2	11.1	-1.5	-8.4
	E060°57.70				
AR	N57°20.00	-72.2	61.7	60.6	-70.8
	E061°55.00				
LPOK	N57°01.10	-33.1	23.4	28.7	-26.3
	E061°13.00				

We can close the calculator for now, load the Airplane in FS at a Gate of your choice in Ekaterinburg-Koltsovo (USSS) and prepare the plane as described in Chapter 4.1. With clear weather, we need approximately 3.5 t of fuel for the climb (at light weight) and with 2000-2200 t/hour around 4.5 tons for the cruise, so with some extra fuel to reach alternates and mandatory remaining fuel we load 20 t of fuel for tanks 1-4 (don't forget to use the build-in fuel loader). We have one additional step now and that is preparing and feeding the NV-PB system.



The above screenshots show the correct designation of all involved units, these designation will be used throughout this tutorial. Let's first have a close look to the main NV-PB control unit P-14:



Switches a) to e) are two position selectors, the lower position simply means 'OFF' («ВЫКЛ»). The following switches f) to j) are three position selectors involving the center neutral position

a) The main power supply. Set switch to upper position «СЕТЬ» to turn the NV-PB System on. This switch **MUST** be also turned on for INS (I-21) and GPS (KLN 90B) operation.

b) The «ЗИП» switch is used for the standard maneuver mode.

c) The switch «KP» turns on the shortest distance notation mode.

d) The switch «KC» refers to a heading hold mode. It is intended as a navigational standby (pause) mode. At actuation of this toggle-switch the NV-PB operational modes and indications do not vary, but the autopilot keeps the heading, which was active before using of the toggle-switch. The toggle-switch is used for system adjustments. E.g. you actuate this toggle-switch, change system set-up and turn the toggle-switch OFF. It allows to avoid any unforeseen manoeuvres of the airplane during navigation set-up. The toggle-switch is also active for I-21 and KLN-90B.

e) «ΠΠΟΓ.ΡС — ΠΠΟΓ. ΠΠΙМ» : Programmed Waypoint Mode

f) The switch «Г—Т» serves as a fine-coarse selector and should always be left in the neutral position in the real plane.

g) RSBN / VOR correction mode switch

h) The notation toggle-switch (СЧИСЛ.) has two positions, pulse and analog. Pulse notation is more exact in the real airplane. For the model both positions of the toggle-switch are equivalent, for uniformity just actuate pulse notation.

i) The switch «ГО—ЧО» is the NV-PB Mode Selector. NV-PB can work in two main modes :

- main orthodromy mode, denoted **ГО**
- navigation leg (or waypoint) mode , denoted **ЧО**

The main orthodromy mode **ГО** is mostly used for waypoints at close distance, often found in departure and arrival procedures. It works with X,Y coordinates, which can be either entered in the Units P4 (X-coordinates) or P5 (Y-coordinates) or provided by up to 10 X,Y entries in the P31-4 programming unit.

The navigation leg (or waypoint) mode **ЧО** is commonly used for enroute navigation. It is similar to the HBY Mode in the Tu-154. It works with orthodromic heading (OZMPU) and distance S. By definition S is entered with a negative sign to the counters, so it counts from negative value UP to zero on the way to the active waypoint.

j) The ЛЗП-I – ЛЗП-II toggle-switch serves for forced switching of active NV-PB Waypoint sets. The middle position provides automatic change of complete sets close to a WPT (ΠΠΙМ) including turn anticipation depending on upcoming track angle change. Upper and lower positions activate the corresponding set.

So, we turn the P-14 Unit on with the switch a) to «СЕТЬ» and besides the P-14 itself we will notice the indications СЧИСЛ, Z and S on the upper blocks P-12 (I), P2 and P3 lighting up. The NV-PB system has two ‘waypoint’ sets P-12, P2 and P3. One of them is active (indicated by the yellow lighting of the indications), the other is inactive.

We have now five different possibilities for the takeoff, let’s have a quick look what we theoretically could use :

1. We could use the navigation leg mode **ЧО** similar to the Tu-154 HBY. The Il-62M operating manual procedure (see Chapter 5.2.3) instructs us to use a leg from the center of the Runway to the last 'output' corridor waypoint (which is LIPOK).

That would require a direct heading of approximately 25 degrees. Since our runway heading is 82 degrees and we would have fly in runway direction for at least a few KM, we would generate a big deviation Z. Together with the turn radius of the Il-62M this would lead to a big correction, which wouldn't look good and would eventually take until LIPOK to correct. This is not useful !

2. Still using mode **ЧО**, we could take 08R08 as a first waypoint for the NV-PB first active set. This has a slight disadvantage, since the waypoint is very close. With the upcoming heading change, the system would be already inside turn anticipation and won't switch automatically (the distance is too short). We would have to use forced switching of waypoint sets, which further increases our high enough workload after takeoff.

3. And again using **ЧО**, we keep runway heading manually after takeoff up to 08R08 and use LIPOK as the first NV-PB waypoint. Since the running NV-PB numeration counts our position relative to LIPOK, we have the choice when we turn the autopilot lateral navigation on. We can NOT activate NV-PB numeration before takeoff, we have to wait until we are close to 08R08. This is not an official procedure, so we shouldn't use it. But using this method we can learn something about the system, so I will include this info as 'EXTRA INFO'. You can detect this EXTRA INFO in the text, because it will have a frame around it.

Please fly this tutorial without reading the EXTRA INFO the first time. If you get more experience, then read and practice also with the info inside the frames.

4. We can use the main orthodromy mode **ГО**, here we have to use X,Y coordinates for the three waypoints 08R0R, LIPOK and AR. For simplicity, we 'extend' the corridor to AR to join the Airway at AR. We would have to enter them manually in the NV-PB counters P4 and P5, in detail described in the procedure in Chapter 5.2.1.

It's only three waypoints, but it has the slight disadvantage of again creating a high workload during the simultaneously needed attention for the climb phase. We'll decide for method 5 :

5. We also use mode **ГО**, but we will take advantage of the programming unit P31-4 to preset our three waypoints. That way we are 'free' from having to enter them manually in flight. A summary of the whole procedure can be found in Chapter 5.2.2. Up to 10 waypoints can be pre-programmed, so this method is almost a MUST for complicated output corridor (in western terminology known as 'SID' !) procedures.

OK, open the Navigator Panel, turn the NV-PB unit on by setting switch a) on the P-14 unit to «CETЬ». Set switch i) to **ГО** mode, you will see the inscriptions СЧИСЛ on the upper P-12, Z and S on the upper P2 / P3, X and Y on the lower P2 / P3 light up. Now set switch a) on the P31-4 unit to the upper position (посадки). That sets the unit in landing (and takeoff) mode. Press the combined button and lamp below the '1' on the big block (f). The lamp will blink !. Enter the X,Y values for waypoint 1 according the following list in the two handles above '1'. You find left and right clickpots for every X,Y handle. Make sure to enter the values with correct sign ! You can control your entries at the unit P4 and P5 !



WPT '1'	X = - 0.2	Y = 11.1
WPT '2'	X = -33.1	Y = 23.4
WPT '3'	X = -72.2	Y = 61.7

Press the button-lamp for '2', enter X, Y pair for WPT '2' and do the same for number '3'. We have now three waypoints programmed. Use Switch d) to store the takeoff set with the upper SAWE function (взлет means takeoff, green light if successful !). Then press the button-lamp '1' again, because it's the first where we will fly to. The next step is to put the runway heading (82.2) in the inactive unit P-12 (that's where the inscription СЧИСЛ does NOT burn and set switch c) on the control unit P-14 to 'KP'. The following picture should result at the blue coloured units :



What can we see on all the blocks ? P-4 and P-5 show the data we entered in the P31-4 for waypoint 1. Y is the value in runway axis, since we entered the runway heading on the inactive P2, it will be transformed by the 'KP' mode to indicate the distance S on the upper P3 unit. Since the runway is approximately 3 KM in length and we have to fly to 08R08 at 8 KM from runway end, that nicely turns out to 11KM. The 'S' value is on the left side of the counter, which means it is negative. By definition the S distance to the next waypoint is negative and will count "UP" to zero. Relative to the runway axis, X is to the left (if negative) or right (if positive). It was very small (only 0.2), so the transformation to our upcoming track to the first waypoint will not change the runway heading noticeably. On the active P-12 we get what we wanted, our track to 08R08 in runway direction.

We also can already prepare the first RSBN correction. Normally it would be at LIPOK, but since it will be quite busy until then, we choose the NDB AR for the first correction. We extract the necessary values from the Flightplan at the AR line and enter : 92* 15' (for 92.3) at the P-9 unit, 69.1 at the P-6 unit and -172.9 (watch the sign) at the P-7 unit. Use the arrow buttons to enter data, right arrow to increase, left arrow to reduce value. Left mouse button does fine changes, right mouse button coarse changes. Check the tooltip to make exact entries ! Headings have to be entered in degree/minute notation. E.g., 0.1 degrees as 5', 0.2 degrees as 10' and so on.

At the previous screenshot the RSBN data is already entered (see the grey blocks in the lower part), you might use it for comparison.

Ok, all set regarding NV-PB, continue to set NavAids to the various devices. I suggest :

187 kHz, AR NDB on ADF 1
388 kHz, BPRM (that's the inner marker beacon) on ADF 2
116.10 MHz VOR/DME Koltsovo on VOR 2
Channel 03, RSBN Koltsovo on RSBN

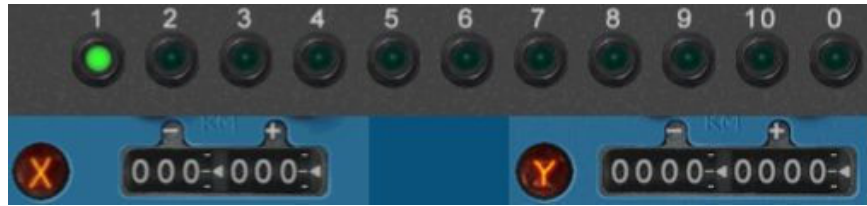
On charts you'll find the Airport RSBN designated as Koltsovo RSBN, in the Navigation calculator it's named Sverdlovsk RSBN. It's the same !

We could put the 08R ILS frequency on VOR1, but since VOR 1 would override the needed RSBN, we skip that one.

We'll be busy with the Navigation, so for the tutorial purpose we keep the vertical part simple and climb straight through to 9600m. Set your altitude alerter on the Digital altimeter to 9600 to get an acoustic reminder.

We taxi to the Runway, line up on 08R and check everything again. All set, all headings correct on HSI, RMI and the Navigator gauges ? We check again the Navigation System selector (255) is in the NV-PB position. Turn the Autopilot Power Supply on (75) and set the Navigation mode switch (77) to "НАВИГ" (for NAVIG). If we have entered all correctly, we should now see the heading pointer on the HSI at 82 degrees.

Right before takeoff turn the Numeration on at the P-14 control unit. That is switch h) to the upper position. We're done with the Navigator panel for now, of course we should be at the Captains panel for takeoff. Once there, press the upper left clickspot at the Captains Panel. That will open an extra panel with P31-4 button lamps and X and Y indications, greatly assisting to keep the picture while in the Captains panel.



Ready to roll....

After takeoff retract gear and flaps accordingly, at an altitude of 200m turn all Autopilot Channels ON (81) and actuate the Navigation Mode by pressing the ГОРЯЗ button (82) at the AP panel.

The plane continues at runway heading, while you see the Y counter run up to the 11 KM total distance. But before reaching that, the button-lamp 1 will start to blink to remind you the turn to LIPOK must be done. It will blink a few KM before, because it calculates the turn anticipation !

You have now two choices. Turn immediately when the lamp starts to blink by pressing the number '2' button-lamp. Or wait until the Y value (11 in this case) is reached and then press the button lamp '2'. The latter would be an overfly situation (sometimes you might have to, according to charts).

Ok, so you have pressed '2' and the plane starts turning to LIPOK, eventually including a slight deviation Z due to the turn radius. If so, it will be corrected by slightly overshooting the turn, the Z deviation value will be 'nulled' that way.

During all that set climb power, use the Autopilot Pitch Wheel (80) to lower the nose for acceleration to 575 km/h. When that is reached, turn on IAS Mode V (61) and don't forget to turn automatic stabilizer rearrangement (66) at the Autopilot Panel.

Approaching LIPOK, button '2' at the P31-4 unit (or the captains info panel at the upper left) will start to blink. Immediately press button-lamp '3' to execute the turn to the Artemovskiy NDB. With that our departure procedure will be finished, we need to transition to enroute Navigation using the Navigation leg mode ЧО.

To initiate that, turn switch "KP" (unit P-14) off and set the switch "ГО-ЧО" (unit P-14) to position "ЧО". We now have to enter our heading (denoted OZMPUv in the flightplan) and distance S data for the first enroute segment AR to TALIK to the inactive unit P-12 (it gets the orthodromic track OZMPU) and the P-5 (it gets the distance S). From the flightplan we get :

OZMPUv (that's the left green column) = 78.9 and S (that's the right green column) = 110.4

We enter 78* 55' in the inactive P-12 Unit by using the arrow buttons. To repeat, right arrow to increase, left arrow to reduce value. Left mouse button does fine changes, right mouse button coarse changes. Check the tooltip to make exact entries ! Headings have to be entered in degree/minute notation. E.g., 0.1 degrees as 5', 0.2 degrees as 10' and so on. That way 78.9 transfers to 78*55'. Enter the S value (with negative sign) in the P5 unit.

At approach to AR there will be an automatic switching incl. turn anticipation to the first track of the enroute part.

Also please watch your climb part. When passing M=0.78M, change the Autopilot Mode from IAS Mode V to Mach Mode M

EXTRA INFO : ‘Special’ Takeoff procedure using Navigation Leg Mode **ЧО**.

We have to fly to a point 8Km from 08R on runway heading (Waypoint 08R08 in flight plan) and then turn left to a heading of 15 degree to Intersection LIPOK.

Ok, so LIPOK goes as a first waypoint to the active set, at the inactive set we’ll put the second waypoint, the NDB AR. At the latter we will also do our first RSBN correction. To reduce workload in flight, we’ll enter RSBN correction data before takeoff. From the flightplan we extract the following orthodromic heading (OZIPU) and distance (S) data :

LIPOK : OZIPU = 15.0, S = 35.7 AR : OZIPU = 36.4, S = 54.8

And for the RSBN correction : Map angle 92.3, Zm = 69.1, Sm = -172.9

We enter 15* 0’ in the active P-12 Unit, in the active P3 unit we enter -35.7 (!! S distance for the waypoint must be entered negative, it’s later counting UP to 0 !!). Negative entry will always appear at the left side of the unit (that’s a good control !)

Only the first OZMPU / S pair can be entered at the P12 / P3 combo, all further waypoints must be entered at the P12 / P5 combo ! So we enter 36* 20’ (for 36.4) at the inactive P-12 and -54.8 at the P5 unit. For the RSBN data we enter 92* 15’ (for 92.3) at P9, 69.1 at P6 and -172.9 (watch the sign) at the P-7 unit to get the following picture :



If you are still with me, continue to set Nav aids to the various devices. I suggest :

187 kHz, AR NDB on ADF 1

388 kHz, BPRM (that's the inner marker beacon) on ADF 2

116.10 MHz VOR/DME Koltsovo on VOR 2

Channel 03, RSBN Koltsovo on RSBN

On charts you'll find the Airport RSBN designated as Koltsovo RSBN, in the Navigation calculator it's named Sverdlovsk RSBN. It's the same !

We could put the 08R ILS frequency on VOR1, but since VOR 1 would override the needed RSBN, we skip that one.

We'll be busy with the Navigation, so for the tutorial purpose we keep the vertical part simple and climb straight through to 9600m. Set your altitude alerter on the Digital altimeter to 9600 to get an acoustic reminder.

We taxi to the Runway, line up on 08R and check everything again. All set, all headings correct on HSI, RMI and the Navigator gauges ? We check again the Navigation System selector (255) is in the NV-PB position. Turn the Autopilot Power Supply on (75) and set the Navigation mode switch (77) to "НАВИГ" (for NAVIG). If we have entered all correctly, we should now see the heading pointer on the HSI at 15 degrees, the heading entered in the active NV-PB waypoint set for the first waypoint LIPOK.

On the RSBN distance indicator (10 on the Captains Panel, 207 on the Navigator Panel) we should see an approx. 3 KM indication. On our takeoff roll we'll see that distance counting down and the azimuth indicator making wild movements, because we will pass the RSBN. After we have passed it, the distance will count up again and when it has reached approx. 6-7 KM, we'll turn NV-PB notation ON and activate the AP Navigation Mode to initiate the left turn to LIPOK. Keep that in mind please and now let's go.

After takeoff retract gear and flaps accordingly. When you see a distance of around 6.5 to 7 KM on the RSBN distance indicator, turn on Numeration (СЧИСЛ) in pulse mode (switch h to upper position) at the P-14 unit and activate the autopilot channels (82) and the roll mode (83). The plane will start the left turn immediately. Due to the turn radius, we'll see a slight Z deviation developing at the active P2 unit. The plane will overshoot the turn a bit to reduce this deviation immediately back to Z=0.

During all that set climb power, use the Autopilot Pitch Wheel (80) to lower the nose for acceleration to 575 km/h. When that is reached, turn on IAS Mode (61) and don't forget to turn automatic stabilizer rearrangement (66) at the Autopilot Panel.

We'll see the distance S to LIPOK counting down at the active P3 unit, for better overview while using the Captains Main panel this information is repeated at gauge (6), together with the Z deviation.

A few KM before LIPOK (depending on the upcoming heading change -> turn anticipation !!) the automatic switching to the next waypoint AR will occur. The active waypoint 'set' changes now to the lower set of P-12, P2 and P3 blocks, visible at their now lighted inscriptions СЧИСЛ, Z and S. We have now free (inactive) units to enter the data for the next leg to TALIK. From the flightplan we extract :

OZMPU = 78.9 (has to be entered as 78* 45') and S = 110.4

We enter this data into the inactive P-12 unit (it gets the 78*45') and the P-5 gets the distance S (remember to enter on left side -> negative sign)

Ok, up to here we're approaching the NDB Artemovsky (AR) with both takeoff methods. Now it's time to mentally prepare for the first RSBN correction. We have to correct due to system specific inaccuracies and maybe for any inaccuracies at the initialization of the counting process. As a result we get a difference between actual and counted position. The course error caused by the Doppler numeration is around 1% of the passed distance. This is not a lot at the first view, for a distance of 1000 KM only 10 KM. But this error will also contribute to the drift Z and will be approximately equal to this value.

Data was already entered before takeoff in the units P-6, P-7 and P-9, so we just wait for a suitable moment to execute the correction. The entered data is relative to the NDB from the RSBN, so we do the correction as close as possible to the AR NDB.

Set the switch g) on the P-14 unit to the upper (RSBN) position. On the light signal board the ПОПРАВКИ (CORRECTION) inscriptions should be illuminated. If it has not taken place, it means we are not in receiving range of the radio source, so there is no data for correction.

Wait until the automatic switching to the next waypoint TALIK occurs, you will notice the light «CMEHA ЛЗП» appear on the left Signal Light Panel. Now set the switch on the P-10 unit to the upper position IND. Wait a few seconds until the calculation is done. If the result is a huge value on any or both ΔZ and ΔS , you might be afraid you have entered something wrong. Just as an example, if a ΔS distance of 80 comes up, then's it's a good sign for a wrong entry before. You will not have a distance offset by 80 KM now, it must be wrong !!

What you get is hopefully small values of Z deviation and S distance. Every waypoint change is accompanied by the light «CMEHA ЛЗП» come up on the left Navigator signal light panel. If that goes out, the waypoint change is completed and we can set the switch to the lower position KORR to execute the correction. The correction will be immediately executed by nulling the counters on the P-10. The correction will be 'transferred' to the active waypoint unit P2 and P3. All done ? Set the KORR switch to the neutral position and turn the RSBN/VOR correction switch on the P-14 back to neutral, too.

EXTRA INFO :

It is also possible to use a VOR/DME for correction ! This is a must outside Russia, where no RSBN is available.

The airplane has two Course-MP units (used for VOR/ILS), two DMEs and the РСБН system. Like in all at default airplanes, VOR-DME works on one frequency, so a distinction between VOR and DME is not possible. But on the DME indicators there are switches which should be turned on to receive range.

On the Il - 62 we find one more special feature : RSBN and the first Course-MP unit work on one channel. We cannot simultaneously use RSBN and the first Course-MP unit. This also concerns the first DME. Such a system feature is not so convenient, but it is implemented in the real airplane and so at the model.

At the upper left corner of the central Navigator board the DME index is located, it always shows DME-2 range. More to the right beside the wind indicator, two digital indices, range and azimuth are located. They show range and azimuth from VOR-1, DME-1 or РСБН. And these range and azimuth are used for NV-PB correction. VOR and DME have higher priority than РСБН. If there is an active VOR signal, the azimuth counter shows the VOR azimuth, irrespective of RSBN presence. This also concerns to DME. So it is necessary to be close if we want to correct

NV-PB on RSBN and it is necessary to detune the VOR frequency. Otherwise azimuth on index and correction are done from the VOR !!

By preparation of data for VOR-DME correction it is necessary to take the angle of VOR beacon installation into account. Not always the angle of the beacon installation is equal to the magnetic declination at the given point, that makes the business complicated. . The difference in correction on RSBN and VOR-DME can be felt, having trained at UNNT. Version 4 of the Navigation Calculator will provide the necessary data, simply choose the VOR from the proposed list of available beacons for correction.

During all that we also have to look at the climb and level-off. Don't forget to transition from IAS Mode (V) to Mach Mode (M) when reaching 0.78M during the climb. Level-off at our cruise altitude 9600m by smoothly reducing the climb rate using the Pitch Wheel and setting Altitude Hold Mode when 9600m is reached. Stabilize the cruise speed at 0.80M

So, our waypoint switching to TALIK has already occurred, we have again a 'free' set to enter the next leg data. It's Tyumen Airport USTR with OZMPU = 79*25' (enter on inactive P-12) and S = 94.9 (enter on P-5). I'd suggest to make a mark in the flightplan for every entered value in the column, so you don't get lost.

And Do NOT attempt to change any value in the active (lighted) counters P12, P2 and P3 unless you are an experienced navigator. You COULD enter any manual correction of heading, deviation or distance if you detect any distance or heading offset, but I'd recommend not to do that for now. We'll get safely to UNNT using the normal correction method with RSBN or VOR.

At TALIK (right after the next automatic switching) we can do the next RSBN correction. Set the correct RSBN channel for Tyumen RSBN (32) on the RSBN device (204 on navigator Panel) and put the following data into the counters :

Map Angle 97*10' (for 97.2) goes into the P-9, Z = 0.1 into the P-8 and S = 0.9 into the P-7 unit. Please note, for the RSBN correction data the S distance is given already with the correct sign. So S = 0.9 must be entered positive into the P-7 !!

We continue that way along our route. At every waypoint switching we have free P-12 and P5 counters for the next OZMPU / S set, after every executed RSBN correction we can prepare the unit set P-9, P-7 and P-8 with the next correction data.

From LEBED to RUBOR we have a 200 KM leg, time to relax and have a coffee.

What else can we do during the cruise? Check the fuel consumption, tune available Nav aids along the route (to backup the NV-PB navigation).

If you gain experience, do the waypoint change manually by setting the forced waypoint switch j) to the corresponding set (J3П-I for forcing the upper set, J3П-II for the other set). It means the turn anticipation will not be calculated and you have to look for that depending on upcoming track angle. According to the Il-62M Operating manual, that manual switching is a part of real procedure !

EXTRA INFO :

We can also have a look at some of the many nice Navigator gauges to get a bigger picture of the whole thing. At the example you see the KUSH-1 after passing Tyumen (USTR). The two pointers, which had been aligned at departure, have now diverged by approximately 4 degrees. Well, that's the fork which has developed by then. And because the magnetic declination has changed only by 0.1 until USTR, the current fork value (look at the flight plan, it's calculated in the Pv column) is almost entirely based on meridian convergence. Remember the nice formula from the Tu-54 manual ?

$$FORK = \Delta M_x - \Delta M_y + (\lambda_x - \lambda_y) \times \sin \frac{\varphi_x + \varphi_y}{2}$$

with Magnetic variation ΔM , Latitude φ and Longitude λ



However, sooner than we think we have to look at our Top-of-descent.

We have to be at the NDB Novotyrshkino (KD) at 1200m, so we must get rid of 9600 m – 1200 m = 8400 m altitude plus speed reduction. We plan for 170-180 KM before KD, which is shortly before reaching the Intersection KENGA. So we'll start descending at KENGA.

But there's one more step to do before descend : The transfer to the magnetic meridian of the arrival airport. In the air that's a more complicated procedure than on the ground and it's recommended to do that on a straight leg to avoid being disturbed by a track change.

We'll start the procedure right after passing the NDB Severnoye (KZ).

EXTRA INFO FOR THE MAGNETIC MERIDIAN TRANSFER :

Here's a quick summary what all the involved gauges indicate :

(1) On the indexes of the USH-3 the following is displayed :

- The great circle aircraft heading which is read out from a meridian at the departure airport (at exhibition of gyroscopic units TKS-P) or arrival airport (arrow «К»). It is provided by the main or monitoring gyroscopic unit (depending on position of the Consumer switch «ПОТРЕБИТЕЛИ» on the PU-11);
- The current track angle (arrow «ПТ») on a signal «УС» from DISS Doppler System;
- The set track angle on a signal from the NV-PB (the triangular index) or
- The current great circle course of the monitoring gyroscopic unit (the triangular index).

(2) Switching of indications of the triangular index is provided with the switch «INDEX УШ-3» on the navigator panel and «ПОТРЕБИТЕЛИ» (CONSUMERS) on the TKS control panel PU-11.

(3) On the indexes of the KUSH-1 the following is displayed:

- The current orthodromic aircraft heading, which is read out from the meridian of departure airport (at the exhibition of gyroscopic units) or arrival airport (arrow «К»), provided by the monitoring gyroscopic unit. Or the main gyroscopic unit at switch position «ПОТРЕБИТЕЛИ» on board PU-11 in position «КОНТР»;
- The current gyromagnetic heading of an airplane irrespective of the position of the mode switch on the PU-11.

On the index there is a button of the fast coordination of an arrow «1» at a magnetic course and the switch « AK, MK, PK ». The switch positions «AK» and «PK» are not involved, therefore the switch is left in position «МК».

For transition to measurement of aircraft heading relative to the magnetic meridian of the arrival airport, please execute the following procedure. If you press the center of the USH-3 and KUSH-1 gauges, you will get digital values to assist making exact adjustments :



First we need to get the plane in heading stabilization mode to conveniently make changes without immediate effect. For this we set the Navigation selector (77) on the autopilot panel to position Купс and then immediately back to НАВИГ. The button-lamp ГОРИЗ (GORIZ, 82) on the Autopilot Panel is out now, a Roll mode is inactive now and the airplane will keep the current heading. We can now do the transfer :

- (1) Set the switch (e) «КОРРЕКЦИЯ» (CORRECTION) on the PU-11 to position «КОНТР»
- (2) Use the switch «ЗАДАТ. КУРСА» (f) on the PU-11 to set the USH-3 triangular index to the heading of the current route segment (in our case we're on a heading of 61,7 to Intersection KENGA) PLUS the FORK value, 22.6 in our case. So we set it to $61.7 + 22.6 = 84.3$.
- (3) press and hold the Button «СОГЛАСОВАНИЕ» on the KUSH-1 gauge
The arrow 1 on the KUSH-1 will now indicate an aircraft heading relative to the current magnetic meridian.
- (4) Set the switch (e) «КОРРЕКЦИЯ» (CORRECTION) on the PU-11 to position « ОЧ »
- (5) Use the switch (f) «ЗАДАТ. КУРСА» on the PU-11 to set the USH-3 Pointers K and PU also to **84.3**.
- (6) On the active OZMPU indicator-setting device (that's the active lighted P-12 unit !) we now change the OZMPU heading relative to the magnetic meridian of arrival airport. We find that on the second OZMPUp column (blue rectangle around it in the flight plan above !) and it's also 84.3 to KENGA. We enter $84^{\circ} 15'$.
- (7) On the active counter of current coordinates (that's the active and lighted P2 unit), establish $Z = 0$

On the HSI we now should see active heading of **84.3** and magically (☺) the heading bug at the same value. We can now make the Navigation Mode НАВИГ active again by pressing the button ГОРИЗ (GORIZ, 82) on the Autopilot Panel. The airplane continues as if nothing has happened, but we are now aligned to the magnetic meridian of arrival airport.

On the KUSH-1 you will see the pointers with a slight difference of around 5 degrees. Why ? Because we have agreed on the Fork of arrival airport, but on the current place we haven't reached it yet (see the value Pp in the Flight Plan). It will consequently catch up during the remaining flight. At UNNT we will see both pointers at the KUSH-1 aligned.

Ok, we continue to KENGA and do not forget to enter data (OZIMUp and S) for the segment to KD and for the RSBN correction at KENGA using the RSBN Novosibirsk (at Channel 24).

Shortly before reaching KENGA we initiate the descend. Reduce thrust to decelerate and at .78M set the autopilot Mach Mode (M). Reduce thrust to slightly above idle and let the airplane settle the vertical speed. When reaching 550 km/h transition to the IAS Mode (V). Set your altitude alerter to 1200M to get an acoustic reminder for level off.

The right turn to the NDB KD will be the last enroute segment and we need to prepare the approach segment. Consider KD to be the initial approach fix.

We will now program our approach using the P31-4 Programming unit. Looking at the Chart (see next page) we take seven waypoints and their necessary X,Y coordinates (see the MO Points list above) :

WPT	X	Y
KD :	32.4	12.6
BPRM-25	0.2	-1.1
A120D10.5	-6.3	-7.5
A107D165	-7.1	-15.2
A095D17.5	-2.1	-16.7
A086D14.0	-1.0	-13.3
TBG-25	0.2	-8.3

So from the NDB KD we continue to the inner marker beacon BPRM for Runway 25, simultaneously descending to 700m, and then follow four waypoints that are denoted with azimuth (A) and distance (D) values relative the Novosibirsk RSBN (24). Passing A086D14.0 we can already activate Localizer Intercept, followed by Glideslope intercept and a hopefully smooth Autoland. If necessary, proceed a visual approach via TBG-25.

OK, now magnify the P31-4 unit, put switch a) to the upper position (посадки) and program the seven points with their X,Y coordinates similar as you have done for takeoff. When finished store them using button d) on the P31-4, you need the lower SAWE part (посадки for landing). A green light confirms the storage. Put switch a) back to neutral for now.

Further continuing to the NDB KD, we prepare the corresponding RSBN correction data. Since we will be in main orthodromy mode when reaching KD, we need to know X,Y coordinates and a Map Angle entry on ht eP-9 needs the true (NOT magnetic !) runway heading as a reference. Always remember, RSBN provide true bearings ! The Calculator has provided these values already, repeated here :

Map Angle (IZPU) = 260.9, X = 0.3, Y = 0.6

And oh, watch the upcoming level-off, which again can be smoothly done by using the Pitch wheel and then altitude Hold mode. Turn Autothrottle On and set a speed of around 450 km/h, it makes the upcoming lateral part a bit easier if we don't need to worry about the speed. Further prepare the upcoming NV-PB Mode transfer by :

- setting the Magnetic heading 252.0 of Runway 25 to the inactive P-12 unit

- setting coordinates of KENGA on the P4 unit (32.4) and the P5 units (12.6). That's necessary due to a slight hiccup in version 1.0, normally these coordinates should be provided by the programming unit. So up to the next version this manual entry is necessary (only for the first waypoint). In future versions, skip that step.

Approximately 30 KM before reaching the NDB KD (distance can be seen on the active P3), we transfer to the main orthodromy mode **ГО**.

- turn the switch 'KC' (d) on the P-14 ON

- change the mode switch (i) to ГО

- put the switch a) on the P31-4 unit to the upper position (посадки) again and press the button-lamp '1' on the big upper (f) block. This should transfer the coordinates of the first waypoint KD to the P4 and P5 unit

- now turn the switch 'KP' (c) on the P-14 ON
- and turn the switch 'KC' (d) on the P-14 Off

The airplane should continue (more or less, depending on offset we achieved since KENGA) on the present heading. Now watch the button light '1' on the P31-4. It starts to blink a few kilometres before reaching KD, it's time to press button-lamp '2' to switch to the next waypoint.

Set your Nav aids (VOR2, ADF1, ADF2,) accordingly, e.g. NSK VOR 113.30, Inner Marker BPRM 310.0, Outer Marker DPRM 597.0.

We can continue with occasional RSBN corrections, because we now have the RSBN continuously referenced, but at some point you need to skip correction and set the VOR 1 to the ILS frequency of 109.30 (remember, VOR1 overrides RSBN !).

We are done with the Navigator panel for now, since we must also fly the plane. That sounds funny, doesn't it ☺.

So move to the Captains panel and open the NV-PB info panel with the Clickspot on the upper left. Just observe the combined button-lights . As soon as the active one starts blinking, it reminds to press the next higher number including a calculated turn anticipation. BUT : If we check the charts, we have to overfly some of the AxxxDyyy waypoints, so we wait until the value on the 'S' counter of the P-4 unit is close to zero ! Then we switch to the next waypoint and just move around the programmed pattern.

During all that, reduce speed, extend the Flaps accordingly and put the Gear down. When you press '6' , you will turn in runway direction at approximately 30 degrees angle. Great to switch to LOC intercept now. Set the Navigation Selector on the Autopilot Panel from NAVIG to ZAX, set the runway heading on the big turn knob to 252 and press GORIZ. Shortly later the Glideslope bar will also move down to center, so press BERTIK accordingly for the Glideslope intercept. Observe your final approach speed and the the chance is big for a beautiful Autoland ☺

Congratulations, you have mastered your first complete NV-PB flight !

EXTRA INFO :

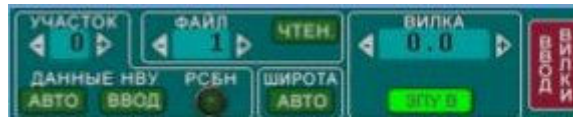
Yes, one more ☺. You can also try to use the standard maneuver mode. In the example flight put X,Y data for the approach waypoints 4, 5 and 6 (those with the AxxxDyyy) into the X,Y handles 8, 9 and 10. See the numbers 1, 2, 3, 4 below in the red rectangle on the P31-4 picture on page 40. These can be used with exact coordinates and the standard maneuvers mode. In our case, use and press the numbers 2, 3, 4 and do not use the button lamps in the circuit graphic, since these are strictly bound to 90 deg changes.

If you like, use the full capabilities of up to 10 waypoint to build even complicated departure (SID) or arrival procedures (STAR). Just make sure the waypoints are not too close of each other , take the turn radius of the Il-62 into account !

Put all departure and arrival waypoints in the Flightplan, that way you get RSBN or VOR correction data for all of them.

I'm use we have only scratched the surface for that gorgeous NV-PB system so far, you'll sure get own ideas for it's flexible usage !!

4.4. Usage of the Virtual Navigator



For usage of the Navigation Assistant the Navigation calculator reads data from the folder ... \Gauges \Tu154_cfg\ . If you don't have the Project Tupolev Tu-154B2 installed (shame on you ☺), it is necessary to create this folder.

Open the Virtual Navigator panel using Clickspot C on the Captains or Navigator Panel. Then in the ФАЙЛ field, choose the same channel number, you have used in calculator when you made the export (see Page 36). Then press "ЧТЕН.". After that press ВВОД, and watch the NV-PB units. The Virtual Navigator will set correct values for the NV-PB equipment. Then press АВТО. If АВТО is enabled, the Virtual Navigator will change waypoints automatically. The current waypoint can be seen in the УЧАСТОК -field.

You can also press АВТО under the ШИРОТА -word. The Virtual Navigator will then automatically enter (and update) the latitude at the TKS panel.

Even easier - set the Virtual Navigator in AUTO mode in lineup position on the runway, turn on СЧИСЛЕНИЕ (automatic counting) before takeoff and forget about problems ☺

Anyway, the autopilot in NAVIG mode will take the flight path and the Virtual Navigator will automatically enter new waypoint sets in the NV-PB counters.

Compare the automatic settings of the assistant with the flight plan. The virtual navigator sets the orthodromic courses ZPU and the distance S with negative values (by convention S counts "up" from negative values to 0).

In the field "Вилка" (it means fork) you see the "fork" value. It will be explained in the following NVU chapter. This value is also shown in the upper section of the NCalc program after calculation. Furthermore it is the value we have to put into the TKS-P system for the transfer to the magnetic meridian of the arrival airport.

Below the Вилка field, you find a switch labelled "ЗПУ-В or ЗПУ-П". Initially ЗПУ-В shows up, reminding us the magnetic meridian of the airport of departure (where we did our compass alignment !) is "in the system".

Now reasonably close to the arrival airport we have to transfer our compass system to the magnetic meridian of the arrival airport. For this we press on ЗПУ-В , it will change to ЗПУ-П. The virtual assistant will now load the ZPU relative to airport of arrival into the NV-PB. So ЗПУ-П now indicates we have the magnetic meridian of the arrival airport in the ZPU fields.

But take care : this will change *the next* waypoint's data. For the present waypoint we must change the heading (ЗПУ) on the active block *manually*. If the FORK is negative then we reduce ЗПУ, if positive - increase ЗПУ.

We can also do the whole transfer procedure of TKS and NV-PB (the complete manual procedure is explained in detail later) fully automatically. For this we open the cover of the red button labelled ВВОД ВИЛКИ with the right mouse button and click in the field with the left mouse button. Before this operation the green ZPU field must show ЗПУ-В ! The TKS-P gyro units will now be transferred AND the NV-PB will be changed to the meridian of the arrival airport.

You can do the TKS transfer yourself and the NV-PB change automatically or you can do both automatically !

It is important to know the virtual navigator does not influence the working NV-PB ! All “his” responsibilities are loading data into the NV-PB and press buttons. You can switch off the ABTO mode in the virtual navigator and manually introduce data anytime. Once finished, you again switch to ABTO mode (but please make sure to change to the appropriate waypoint number in this case)

4.5. Usage of the I-21 INS

The Panel “ПУП”



Main Operation-Switch:

“ОТКЛ”	-System off
“обогр”	-System “warmup”
“ВЫСТ”	-System on
“навиг”	-System set to Navigation-Mode
“КВ”	-not modelled

Control-Lights:

“НЕГОТ”	-after „warmup“, System ready
“ВНИМ”	-Alignment-Error, if illuminate you must restart the “И-21”
“ПИТ”	-Battery low
“КВ”	-not modelled
“ОТКАЗ”	-not modelled

Button “КОНТР ламп”-when pushed, all Lights should be illuminated

Attention!

Don't move the Aircraft and make sure the Engines are NOT running during Alignment!
Otherwise, the Alignment Process will abort!

The Panel “УВИ”

In the right upper corner there's a Clickspot for using the Keyboard to make your Entries in the INS.



Using the Keyboard with “И-21”:

Button „0-9“ = 0-9 on Num-Pad
Button „ВВОД“ = Enter on Num-Pad
Button „ИЗМ МАРШ“ = (.) on Num-Pad
Button „ОСТ ИНД“ = (+) on Num-Pad
Button „СБРОС“ = (-) on Num-Pad

With (+) and (-) on your Main-Keyboard (NOT NUM-PAD) you can switch the Number of Waypoint “ЛЗП” up and down.

Operation of the “И-21” (for both units)

Attention!

Don't move the Aircraft and make sure the Engines are NOT running during Alignment! Otherwise, the Alignment Process will abort!

On the Panel “ПУР”, set the Main-Operation-Switch to “обор”. If the “НЕГОТ”-Light comes up (after a few seconds) set the Switch to “выст”. Now the Alignment starts, lets go to the Panel “УВИ”.

Press (Shift+Z) in Flight simulator. In the left upper Corner of the Screen, MSFS shows your actual LAT/LON of your present position.

Attention!

For Degrees and Minutes, a “0”-Value will not shown by Flight Simulator! An Example:

N55*23.05 E12*3.56 shown by FS means N55*23.05 E012*03.56. The Format for insert to “И-21” would be N5523.0 E1203.5

Another:

N46*6.35 E154*68.48 shown by FS means N46*06.35 E154*68.48.

Our Format will be N4606.3 E15468.4

Set the Switch “ПАРАМЕТРЫ” to „ИК/ПГ“. There should be an Value of “90” in the Main display”

Set the Switch “ПАРАМЕТРЫ” back to “φ/λ”. Now insert your present position shown by Flight Simulator. To insert a “North”-Latitude, press “N/2” first at the Num-Block of the “И-21”, then the Values. (for “South” press “8/S” first). Press „ВВОД“ to make your entry. Now insert the Longitude (for “East” press “E/6” first, for “West” press “W/4”). Verify your entry by pressing „ВВОД“ again.

Now set the Switch “ПАРАМЕТРЫ” to “T/t” and insert the actual Time. Press “N/2” and insert the Time in Format hh:mm. Press „ВВОД“. (I’m using UTC-Time, but it’s your Choice). With „СБРОС“ you can clear the Display if you have made a Mistake during insert your Position or Waypoints.

Attention!

You must insert your Position and Time before „ИК/ПГ“ reached a Value of “70” . Otherwise, the Alignment will abort. But there is enough Time to make your Entries.

Now set the Switch “ПАРАМЕТРЫ” to “ППМ”. Now you can insert the LAT/LON of your first 9 Waypoints. You can switch between the Waypoints by the two little switches over and under the Digit which shows the present Waypoint “ЛЗП” **DON'T USE “0”!**

If you are ready with the entry of Waypoints, set “ПАРАМЕТРЫ” back to „ИК/ПГ“. If it shows “0” in the second (under) line in Main-Display, the System is ready for Navigation. In the Panel “ПУР” set the Switch to “навиг”. Now in the Main-Display, the Values for “От-До” should be “1” and “2”. This means that the “И-21” will navigate from Waypoint 1 to 2. Make sure that the switch “Смена ЛЗП” is set to “авт”. This will Change the Waypoints automatically. If you have more as 9 Waypoints on your Route you must insert the Next Waypoints before you reach Waypoint 9. Otherwise you will go back (hihi), the “И-21” switches from “9” to “1”.

Manual Waypoint Change/Directs:

If you want to change the Waypoints manual, set “Смена ЛЗП” to “ручн”. Now press „ИЗМ МАРШ“ and enter the new Waypoints where you want to fly from/to. Press „ВВОД“.

If you want to fly a Direct (i.e.: you are flying to WP4 but want direct to 6) set “Смена ЛЗП” to “ручн”. Now press „ИЗМ МАРШ“ and enter 0-6. Press „ВВОД“ and set “Смена ЛЗП” back to “авт”.

Other Parameters (Switch “ПАРАМЕТРЫ”):

“ЗПУ/ПУ”	-your Course to the next Waypoint
“S/Z”	-the Distance (in km) and Drift to the next Waypoint
“W/УС”	-Wind and Groundspeed?
„T/t“	-actual Time/time to reach the next Waypoint

Couple the “И-21” with the Autopilot

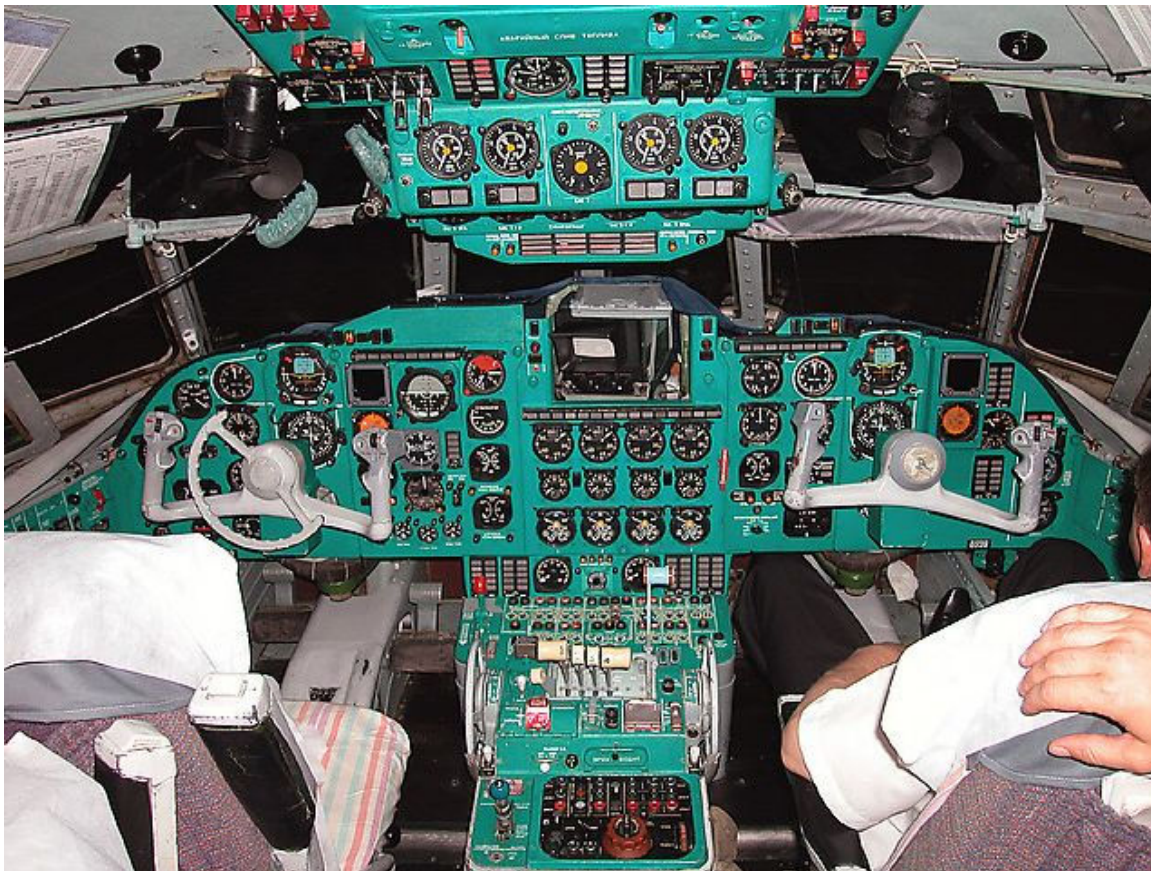
On the INS-Panel, set the Switch in the left upper Corner to “ИНС”. Make sure, the active Navigation System selector is set to INS-1. The И-21 is now coupled to the NV-PB. In flight, at switch position НАВИГ, press the button ГОРИЗ on the autopilot panel.

Close to the Arrival-Airport, the Compass-System needs realignment, see Chapter 4.3. for details.

You might also want to use the EXPORT Function of the NCALC Navigation Calculator (see Page 36) to export a flightplan for the INS and load these data to the INS as follows. Data gets stored in the file ../gauges/i21_cfg/I21_PPM.CFG

Input of Lat/Lon Coordinates from the file is done as follows : Set the switch ПАПAMEТРЫ to position ПИИМ. On the ПИИМ switch the Waypoint gets out, whose coordinates shall be entered. Now the button '0' must be pressed. Now the upper and lower indicators light up according to LAT PPM and LON PPM.

The first number of a route waypoint is entered according to the number of the waypoint in the file. The second number is taken from the position of the ПИИМ switch. So e.g. at position 7 of the ПИИМ switch and pressing the key '2' the 27th waypoint is entered. The waypoint number is displayed on the indicator. Now press the key ВВОД. Proceed this way for all waypoints.



5. APPENDIX

5.1. Device configuration settings

The file IL62_GAU.CFG can be found in the folder /GAUGES/IL62_CFG

non_fixed_flaps=1

Parameter for continuous flaps (without intermediate fixings). On the Il-62M airplane the flaps can be extended in any intermediate rule. In the model it can be made using the mouse on the Flaps lever or using two Joystick buttons. With the parameter =1 the keys F5-F8 do not work. If the factor is equal to zero, the default flaps operation is reestablished and the keys F5-F8 work. Then the flaps unrealistically have two locked positions, 15 and 30 degrees.

revers_handle_on=1

Control of reverse thrust using a reverse thrust lever. This parameter is recommended to be established, if a Joystick button for activation of reverse (or better a toggle switch with fixing) is available and configured using the Joystick Service device. Then more realistic control of reverse thrust is provided. Pressing of the button shifts the reverser doors (the button should be held).

Thrust force depends on the lever position. It is allowed to use after thrust levers have been moved to idle and reverser doors are shifted. After contact it is necessary to move thrust levers forward against the stop (the reverse thrust mode will be established automatically at opened reverser doors).

revers_differenc_on=1

That function contradicts realism. But by differential reverse thrust control during pushback is improved. Just use if you like ☺

thrust_correct=1

Program for correction of engine thrust for more exact conformity of thrust to real engine characteristics. While the correction is carried out rather approximately, it's basically entered to test the correction for absence of glitches.

panels_auto=1

Autoordering of panels at loading. It will avoid overlap of subpanels.

tail_gear_var=1

Version of modeling of the additional landing gear tail support. Default is version 1. Version 0 is less realistic (see further explanation in the following text)

azs_nose_gear_pos=1

position of the toggle-switch for activation of nosewheel control at loading of the model.

At the Il - 62M the nosewheel control is implemented as a separate control wheel with the help of a monitoring hydraulic system. In flight the control should be switched off, reminded by a corresponding light signal on the board of the landing gear signal system.. The control is activated after landing and lowering of the nose gear. The trigger for activation of actuation is located on the Captains control wheel.

In the model the nose wheel is operated from pedals (rudder). The turn angle of the gear at full deflection of a control surface depends on speed. These angles correspond on low speed to operating manual limitations at wheel deviation angles. At high speeds the angle is limited to 15 deg. The toggle-switch for control activation is located on the Captains left board (shift_1).

There is a capability to deduce convenient activation of control to a Joystick button. At the switched off control, taxiing is possible only with the help of differential brakes.

load_and_fuel_saw_on=1

Saving of loading and refuelling state of the airplane. If the attribute is established, at “unloading” of model refuelling and loading are saved in a file and loaded at the following start of model. The position of the tail support of the landing gear is also saved.

msrp_speed_min=100

Speed in km\h, minimum speed for MSRP data recording

msrp_one_file=0

Attribute for data recording of the FDR (flight data recorder) in one re-recorded file

Other parameters in the configuration file are intended for automatic preservation of parameters and should not be manually edited.

5.2. NV-PB procedures

The following chapter contains directly translated excerpts from the II-62M operating manual, Chapter NV-PB procedures. It is included in the documentation as helpful material for experimenting with the system. There might be some discrepancies regarding the model.

5.2.1. Departure in main orthodromy mode «ГО»

- (1) set switch " ГО-ЧО " (unit P-14) to position «ГО»
- (2) turn on unit P-14 using the switch «СЕТЬ»
- (3) at the indicators X and Y on active counters of units P-2 and P-3 (symbols «X» and «Y» lighted), set values X=0 and Y=0
- (4) at the heading Indicator/Setting device ("free" scale of unit P-12 with NOT lighted «СЧИСЛ»), set takeoff heading
- (5) at the Indicators/Setting devices of waypoint coordinates (units P-4 and P-5) - establish values of rectangular X and Y coordinates of the first departure (SID) waypoint
- (6) Turn on switch " KP " (unit P-14)

On the inactive heading indicator/setting device ("active" scale of unit P-12 with NOT lighted «СЧИСЛ» indication), the track angle of the first waypoint from end of runway should be displayed (fulfilled).

On counters of the current coordinates (counters of units P-2 and P-3 on which symbols «Z» and «S» burn), the values Z=0 and S should be displayed, equal to distance from runway end to the first WPT.

- (7) Establish data for RSBN correction at the indicators/Setting devices of correction coordinates (units P-6 and P-7)

- (8) Establish data for RSBN correction (map angle) at the indicator-setting device (unit P-9)

(9) Before takeoff (lined up on on runway) set switch " СЧИСЛ " on P-14 to position «ИМП»
During takeoff the current coordinates on "active" counters of units P-2 and P-3 start to change.
After climb of 200 m:

- (10) Set Autopilot Mode Switch (AP control panel) to position "НАВИГ" (Navig).

Press Button " ГОРИЗ " (AP control panel)

The airplane will follow to the first departure waypoint

At approach to the first waypoint):

- (11) Turn on switch " KC " (unit P-14)

- (12) Establish values of the next WPT coordinates at the indicators-setting devices of waypoint coordinates (units P-4 and P-5)

- (13) After reaching the first waypoint.turn off switch " KC "

The airplane will follow to the next WPT. Continue for all waypoints until reaching last departure point (transition to route navigation follows).

Correct airplane coordinates using RSBN correction, if necessary.

After turn of the airplane to the last WPT in the airport zone/SID a transition of coordinate notation to the navigation leg (waypoint) mode " ЧО " must be done :

- (14) Turn off switch " KP " (unit P-14)

- (15) Set switch " ГО-ЧО " (unit P-14) to position " ЧО "

- (16) At the indicator/Setting device OZPU1 (unit P-12) : Establish value OЗПВ of the first enroute segment
- (17) Establish values $Z = 0$ and S , equal to length of the first route segment , at the setting device of waypoint coordinates (units P-4, P-5)
At approach to the last waypoint, there will be an automatic switching incl. turn anticipation to the first track of the enroute part.
- (18) Establish orthodromic heading value OZMPU of the second route segment using the indicator/setting device OZPU2 (unit P-12)
- (19) Establish values $Z=0$ and S , equal to length of the second route segment , at the setting device of waypoint coordinates (units P-4, P-5)

Consequently continue with all following route segments.

5.2.2. Departure using the Route and Landing programming unit P31-4

A programmed departure using the P31-4 is similar to the modes «ГО» and «КР».

Before taxi :

- (1) Switch "ГО-ЧО" should be established in position "ЧО".
Input all waypoint X,Y coordinates, starting at the left handles of potentiometers X and Y on the P31-4 unit.
- (2) On the setting devices of waypoint coordinates (units P-4 and P-5), set values X and Y (less than 200 km)
- (3) turn the switch «ЗИП» (unit P-14) ON
- (4) Set the magnetic runway heading (OZMPU runway) on the "free" scale of the OZMPU setting device (unit P-12),
- (5) Press the button-lamp corresponding to the set point programs (unit P-31-4) twice

On counters of units P-4 and P-5 coordinates of the set point of the program will be fulfilled. The up to this moment 'free' scale of unit P-12 becomes "worker", and on a becoming "free" scale of unit P-12 the value of a line of the shortest distance up to the set point of the program will be fulfilled.

- (6) Establish zero coordinates: $X=0$, $Y=0$ on the counters of the current coordinates ("working" counters of units P-2 and P-3)

On the 'free' counter of the P-3 unit, the value S equal to the distance to the programmed point will be displayed.

$Z=0$ will be displayed $Z=0$ on the "free" counter of unit P-2,

- (7) on the setting devices of correction coordinates (units P-6 and P-7), establish coordinates of radio beacon Z and S in the runway coordinate system.
- (8) Set the RSBN map angle on the unit P-9
- (9) Lined up on runway, set switch " СЧИСЛ " on P-14 in upper position «ИМП»

During takeoff the values of the current coordinates on the "working" counters of units P-2 and P-3 start to change.

After climb to 200 m :

(10) Connect NV-PB to the Autopilot.

The airplane will follow on the shortest distance to programmed point.

(11) Press corresponding buttons-lamps on the P31-4 unit to consecutively programmed waypoints. Execute RSBN or VOR coordinate correction if necessary.

After turn of an airplane to the last departure corridor (STAR) waypoint :

(12) Turn OFF switch "ЗНП" (unit P-14)

(13) At the setting device of waypoint coordinates (units P-4 and P-5), establish values $Z = 0$ and S , equal to the distance of the first route waypoint.

(14) Establish OZMPU value of the first route segment on a "free" scale of the setting device OZPU (unit P-12)

At approach of the airplane to the last departure waypoint:

At appropriate distance (turn anticipation depending on value of heading change), the airplane will start to leave to the track of the first enroute segment.

5.2.3. Departure in "navigation leg" mode «ЧО»

In this case for ИПМ the center of an aerodrome of departure is received, and the used track angles are determined relative a magnetic meridian of departure airport.

(1) set the switch «ЛЗП-I — ЛЗП-II» to position "ЛЗП-I"

(2) set the switch «ГО — ЧО» to position "ЧО"

(3) turn the switch «СЕТЬ» ON

(4) At the counters of the current coordinates ("working" counters of units P-2 and P-3) :

Establish values $Z = 0$ and S , equal to length of the first waypoint

(5) Establish values OZPU of the first and second departure waypoint at the heading

Indicator/Setting devices OZPU1 and OZPU2 (units P-12)

Note:

1. OZPU and the length of the first departure waypoint is taken from the center of the runway to the last departure (SID) waypoint.

2. OZPU and the length of the second waypoint are taken from the last departure waypoint to the first enroute waypoint.

(6) At the setting devices of waypoint coordinates of a WPT (units P-4 and P-5) , establish values $Z=0$ and S , equal to length of the second departure waypoint.

(7) set the switch «ЛЗП-I — ЛЗП-II» to neutral position

(8) Lined up on runway, set the switch "СЧИСЛ" on the P-14 control panel to position «ИМП»

During takeoff the values of the current coordinates on the "working" counters of units P-2 and P-3 start to change.

(9) After turn at the approach to the last departure waypoint connect NV-PB to the Autopilot. The airplane will leave on the first route segment. At transition to a new great circle there is a change of "working" and "free" counters of units P-2 and P-3 and scales of unit P-12.

(10) Indicator-setting device OZPU | (unit P-12)

Establish value O3ΠY of the second route segment

(11) On the setting device of waypoint coordinates (units P-4, P-5), enter values Z=0 and S, equal to length of the second route segment

5.2.4. Enroute Flight in "NAVIGATION LEG" mode «ЧО»

1. Transition to the following route segment :

At the approach to the next WPT a change of "working" and "free" counters of units P-2 and Π-3 occurs: results of notation start to act on the former earlier "free" counters. At change of counters of notation there is a change of indication at counters: lights of former "working" counters go out and light up on the new counter set.

The airplane continues on the new track. On light-signal boards of pilots and navigator the inscription «CMEHA ЛЗΠ» lights up.

In the mode «ЧО» pilots always have indication of the airplane position relative to the current navigation leg (Z and S) on the P-33-4 unit. Transition to the following great circle can be executed compulsorily prior to the beginning turn. For this purpose:

(1) set the switch «ЛЗΠ-I - ЛЗΠ-II» (unit P-14) to position «ЛЗΠ-I» (or «ЛЗΠ-II») , corresponding to counters, on which there is active notation)

At approaching the necessary turn .

(2) set the switch «ЛЗΠ-I - ЛЗΠ-II» (unit P-14) to position «ЛЗΠ-II» (or «ЛЗΠ-I»)

On light-signal boards of pilots and Navigator the inscription «CMEHA ЛЗΠ» will light up.

After turning of the airplane to the new track:

(3)) set the switch «ЛЗΠ-I - ЛЗΠ-II» (unit P-14) to neutral position.

The inscription «CMEHA ЛЗΠ» on the light-signal boards of pilots and navigator will go out.

NOTE : After change of counters the following change can be made not earlier than through 30s.

After flight to next WPT enter coordinates of the following navigation leg.

(4) Establish OZPU of following route segment on the setting device OZPU ("free" scale of unit P-12)

(5) Setting devices of waypoint coordinates ("free" scales of units P-2 and Π-3) :

Establish values Z =0 and S, equal to length of the following navigation leg

Data input for all subsequent great circles are made similar. At change of a great circle establish correction coordinates on units P-6 and P-7 related to new track.

5.2.5. Flight on the shortest distance at coordinate notation in the navigation leg mode «КР»

If needed, route changes and transition to new waypoints can be made in "shortest distance mode" «КР» as follows :

(1) Establish coordinates Z and S of a WPT relative to the current track line on the setting devices of WPT coordinates (units P-4 and Π-5)

(2) Turn the switch " КР " (unit P-14) ON

The set track to the new waypoint should be fulfilled on the "free" scale of indicator-setting device OZPU (unit P-12). Z=0 and S, equal to distance up to a new WPT, will be visible on the "free" counters of the current coordinates (units P-2 and P-3).

(3) The switch «ЛЗП-I - ЛЗП-II» : Establish in the position corresponding to the position of "free" counters of the current coordinates (units P-2 and P-3 on which symbols Z and S do not burn)

On light-signal boards of pilots and Navigator the inscription «CMEHA ЛЗП» will light up. After turning of the airplane to the new track:

(4) Turn the switch " KP " (unit P-14) OFF

(5) set the switch «ЛЗП-I - ЛЗП-II» (unit P-14) to neutral position.

On light-signal boards of pilots and Navigator the inscription «CMEHA ЛЗП» will go out. The airplane will follow on the shortest distance to the next WPT of the changed route.

5.2.6. Flight to short route segments using the programming unit P-31-4

If during an enroute flight there are some short distance waypoints (length less than 100 km), these waypoints can be passed in automatic mode with use of the programming unit.

Previously before departure or on one long enroute segment it is necessary to program this short range waypoint coordinates. Programming in flight is authorized to be made on any straight-line route segment not later than 90 km up to the next WPT. It is necessary to have time after input of the program coordinates to restore waypoint coordinates on counters P-4 and P-5 before operation of the next turn (S should be no more than 20 km).

Programming is made in the coordinate system connected to the last waypoint of a long route segment, after which the programmed short route segments begin. This last waypoint WPT is taken as origin. The axis Y coincides with this waypoint and is directed in aircraft motion direction, while axis X is directed to the right from the Y axis.

The main programming conditions:

- The general number of programmed WPT should not exceed ten, including origin and end waypoint;
- Distances between programmed WPT should be more than 15 km.

Programming of short range waypoint coordinates :

(1) set the switch " YCT.ППОГР " (unit P-31-4) to position «МАРШПУТ» (ROUTE)

(2) Press the first button-lamp at the left of unit P-31-4. The pressed button-lamp lights up.

(3) Handles " X " and «Y» (the first at the left of unit P-31-4)

Turn until the coordinates $X=0$, $Y=0$ are established on counters of units P-4 and P-5

(4) press the second button-lamp (unit P-31-4), the second button-lamp lights up, the first simultaneously goes out..

(5) Handles " X " and «Y» (the second at the left. of unit P-31-4)

Turn until the coordinates of a WPT of the first short range waypoint in the coordinate system of the waypoint of last long route segment are established (on counters of units P-4 and P-5)

(6) Enter coordinates of all short range WPT with the help of the corresponding handles « X>, «Y», use the technique specified in item (2) — (5).

(7) set the switch «YCT. ППОГР» to neutral position

5.2.7. Flight on short waypoint distance using the programming unit P31-4

At approach to a WPT of last long site on distance not less than 30 km:

We define a long segment with a last waypoint of that segment. That 'last' waypoint defines the coordinate system for the following.

- (1) On the "free" heading setting device OZPU (unit P-12) : Set the same OZPU value as on the "working" setting device
- (2) set the switch «ІПОГ. РС - ІПОГ. ПІІМ» (unit P-14-4) to position «ІПОГР. ПІІМ»
- (3) press the first button-lamp at the left (unit P-31-4)

The pressed button-lamp lights up. The values $X=0$, $Y=0$ are fulfilled on the counters of the P-4, and P-5 units.

Press the same button a second time, thus on the free present position indicators the indices X and Y will be lighted and on the free indicator-setting device OZPU the light-signal board «СЧИСЛ» will light up. These indicators become 'workers'. On the free present position indicators will be displayed $Z = 0$ and S , equal to the remaining distance to the initial Waypoint.

- (4) When approaching the initial waypoint (at turn anticipation distance), press the second button-lamp. It will be lighted after pressing, while the previous one will go out. On indicators/setting devices of waypoint coordinates the values X and Y of the initial waypoint will be fulfilled. The airplane will begin turn to this WPT and will follow to it on the shortest distance.

On the free present position indicators will be displayed $Z=0$ and S , equal to the remaining distance up to the next WPT, and on free indicator-setting device OZPU - OZMPU of the current short segment.

On the "free" counters of units P-2 and P-3, the symbols «X», «Y», light up, on the "free" setting device OZPU (unit P-12) the inscription «СЧИСЛ» lights up. From this moment these counters and the setting device become "workers". On them constantly during the entire flight on the programmed route, the notation of current airplane coordinates in the coordinate system of the last 'long segment' waypoint is displayed. And from this moment on the "free" counters of units P-2 and P-3 $Z = 0$ and S are displayed, equal to distance to the WPT of the first short site on the shortest distance. These counters remain "free" up to the end of flight on the programmed route and on them are displayed $Z = 0$ and S , equal to range on the shortest distance up to the next programmed waypoint. On a "free" scale of unit P-12 the value OZPU is displayed for this WPT.

The airplane will turn and will follow to a WPT of the first short site on the shortest distance.

- (5) Flight on the following WPT of short sites is made similar.

After turn to a waypoint WPT of last short segment:

- (6) set the switch «ІПОГ. РС — ІПОГ. ПІІМ» to neutral position

On the "working" counters of units P-2 and P-3 the symbols «X» and «Y» will go out.

On the "working" setting device OZPU (unit P-12) will go out, and on "free" setting device OZPU inscription «СЧИСЛ» will light up. There will be a change of "working" and "free" counters of coordinates and setting devices OZPU.

Counters of coordinates and setting devices OZPU, former during programmed flight "free", become "workers" from this moment.

(7) Set OZPU of the next segment on the "free" setting device OZPU (unit P-12)

(8) on the setting devices of waypoint coordinates (units P-4 and P-5) :

Set values $Z = 0$ and S , equal to length of the next segment. Continue flight as usual in "navigation leg" mode «ЧО».

5.2.8. Approach at coordinate notation in main orthodromy mode «ГО»

At approach to the first WPT of an input corridor of the arrival airport (STAR) or nearing the initial approach fix on approx. 50—70 km :

(1) establish a magnetic landing heading at the "free" scale of the Indicator-setting device OZPU (unit P-12)

(2) on the Indicators-setting devices of a WPT (units P-4 and P-5) : Establish rectangular waypoint coordinates regarding runway threshold.

(3) set the switch «ГО — ЧО» (unit P-14) to position «ГО»

(4) turn the Switch "KP" ON (unit P-14)

At approach to a WPT on 15—20 km

(5) turn the Switch "KC" ON (unit P-14)

(6) Establish rectangular coordinates of the next WPT in airport zone on the waypoint indicators-setting devices (units P-4 and П-5)

(7) Turn the switch "KC" OFF (unit P-14)

At approach to the first point of the big rectangular course : Continue flight, similarly using coordinates in mode «ГО» regarding runway center on current coordinate counters (units P-2 and P-3 with lighted «X» and «Y» symbols).

5.3. MCPII-64 Flight Data Recorder and OCS Analyser

The MCPII -64 system of the registration of flight data is intended for the record of flight parameters for the purpose of a subsequent analysis.



Control panel. The following control elements and indications are located on the control panel MCPII-64 control panel (in the real instrument):

1. Lamp to indicate the recording of the basic tape-drive mechanism.
2. Toggle switch to start the basic tape-drive mechanism.
3. Lamp to indicate the recording of the additional tape-drive mechanism.
4. Toggle switch to start of additional tape-drive mechanism.
5. Lamp to indicate readiness of feeding.
6. Toggle switch to turn the illumination on.
7. Lamp to indicate the work of the vocal chart recorder Mars.
8. Button for the inspection the work of lamps (control).
9. Switches to set the included date and flight number.

The designation of the control elements and the signaling of the model differ a little from real. Only one recording channel is used (chart recorder). For control and signalling of the operating mode the toggle switches 2, 4, 6 and the lamp 1 and 3 are used. Lamp 5 lights up with proper working order of MCPII feeding, lamp 7 is not used.

The record of information is written into a text file in the directory `..\Gauges\il62_cfg\MSRP\`. There are two versions of the filename selection for the record, assigned in the file `il62_.gau.cfg`. If in the SYSTEM section `msrp_one_file=1` is specified, the record is always written into the file `msrp.txt`. If in the SYSTEM section the entry `msrp_one_file=0` is used, the name of the file for the record is generated including the date and flight number.

For the start of the MCPII system it is necessary (with lamp 5 lit) to turn on the toggle switches 2 and 4 on the panel. In this case the lamps 1 and 3 will identify the MSRP operation mode. If the lamps burn continuously, it means the file is opened for the record, but data is not yet written. The record is produced if the lamps blink.

Blocking of recording with MCPII turned on is done for the purpose to decrease the file size. In the SYSTEM section of the file `il62_.gau.cfg` it is possible to assign a minimum speed for the beginning of the recording, for example `msrp_speed_min=100`. This makes it possible to automatically block the recording of data during taxiing. The pause of recording can be manually done by turning off the switch ОДИН. With reclosing of this switch the recording will continue.

To disconnect the MSRP it is necessary to turn off both toggle switches. In this case the lamps 1 and 3 will extinguish and the file will be closed.

Usage of MSRP. Before flight set up the date and the flight number on the MSRP panel and turn on the toggle switches 2 and 4. After the flight toggle the switches off to turn off the system. For decoding of the record the OCS data analyser is available separately on our Website.

Frequency of record. During cruise, the record is generated every three seconds. In the takeoff and landing stages, depending on height, speed and flaps, the record is produced with a frequency of one to six times per second. To force a high frequency record during any flight phase the toggle switch (6) can be used. The shielded wire clamp can be opened with the right mouse button. In this case the 10000 line limitation must be taken into account. After this, the record is produced from the beginning of the file and the previous values are overwritten. So a maximum of 10000 records are stored.

Written parameters :

Analog parameters (parameter and unit)

el_time - time since the beginning of the work of MCPPI, s
time - current time in hours, minutes, seconds
m_kurs - magnetic heading with TKC, degrees
kren - bank from the vertical gyros, degrees
tang - pitch from the vertical gyros, degrees
alt_bar - barometric altitude (on standard pressure), meters
alt_r - radio altitude with PB-5M, meters
IAS - speed instrument, km/h
v_y - vertical velocity, m/s
alpfa - angle of attack with AYACII, degrees
n_y - vertical overload with AYACII
kolonka - position of control column in percentages of full deflection
RV_pos - surface position height, degrees
MET_pos - position MET in percentages of full deflection
stab_pos - position of stabilizer, degrees
el_pos - position of left aileron, degrees
RP_pos - surface position turn, degrees
flaps_pos - position of flaps, degrees
COG - centering in the percentages CAX
eng1_n1 - rpm of the first engine, percentage
teng1_n2 - rpm of the first engine, percentages
fuelflow - fuel consumption of the first engine, tons per hour
latt - current latitude, degrees
long - current length, degrees

Discrete signals

on_ground - aircraft on the ground (reduction of basic counters)

AP_kren – ABSU bank channel working mode

0- activated

1- manual control

2- bank stabilization

3- 3K, heading select mode

4- HBY

5- A3-I

6- A3-II

7- Localizer (approach)

8- GoAround

AP_tang – ABSU pitch channel working mode

0- activated

1- manual control

2- pitch stabilization

3- M (IAS Mach Mode)

4- V (IAS Mode)

5- H (Altitude Hold Mode)

6- Glidepath (Glissade)

7- GoAround

AT – Autothrottle working mode

0 - agreement

1 - preparation

2 - speed hold

3 - GoAround

Gear - landing gear extended

Spoilers – spoiler locks are opened

OMI - signal of the marker receiver

OCS DATA ANALYSER

The OCS Analyser is available as a separate download from the Project Tupolev Website – the filename is **ocs_pt_154.rar**. Unzip the rar file, execute the exe installer and point it to an installation directory of your choice.

The program should automatically detect your language according to the windows setting. The program creates an entry in your registry at HKEY_CURRENT_USER\Software\VB and VBA Program Settings\OCS_Decryptor. Here a key *lang* is included, which contains the value *CurrentLanguageSet*.. Just in case the automatic language detection did not work : The value might be manually changed to the data value *english*.

1. Purpose.

The program is intended for processing, analysis and studying of data of records stored in flight using the MSRP-64 flight data recorder. It can be used to examine piloting techniques, educational purposes and studying of the functionality of systems, also for the analysis regarding reasons of flight incidents.

2. Loading data.

After starting the program (OCS-Decryptor.exe), execute the command File / Open from the menu and point to the MSRP-64 txt data files, usually located in the folder <FS 2004 Main>/gauges/Il62_cfg/MSRP. As the records might contain up to 10000 lines of data, the loading can take quite some time.

3. Filtering functions.

To assist in concentrating on specific data or a quick search for particular information, several filtering functions are provided. Access to filters is available using the through the menu Filters. Some filters can be simultaneously involved, which further allows to narrow the search area. For a special filtering association, the operators AND, OR, XOR are provided (Filters, Conditions join ...). The filtered entries will show up in red colour by default, the colour can be changed in File/Options.

4. The options menu (File/options)

- select the parameters you want to display in the graphical parameter representation by clicking the corresponding checkboxes. For each parameter, the colour can be individually chosen. Also for every parameter the minimum and maximum margin and the axis position can be chosen.

5. The graphical display

The graphical display window is available via Analyze / Show Graph. At the first call, also depending if you have preselected parameters to be displayed in the Options menu, the graphical display might be empty.

An additional floating panel can be opened using Graphs / Panel (or F8). Here the colours of the parameters can be directly changed and their display activated by selecting using the boxes to the right of the colour. Any change will be directly displayed in the graphic window.

If you move the scroll bar on the x-axis (time axis), the values in the floating panel will change dynamically. The vertical green line can also be used to scroll through the data in the time axis. Just click on the vertical line with the left mouse and hold the left mouse button while moving the line left or right. Again, the values in the floating panel change accordingly.

Simultaneously, also the table in the main window changes and follows the change on the time axis.

To reduce the display range there is a capability to specify a particular range. The corresponding allocation can be done directly in the data table of the main window with either mouse (Press and hold left button and move over columns) or from the keyboard using the keys Shift and Control.

5. The analyzer of violations

The analyse process can be started via Analyze / Show violations (F8). The routine will check your entire data set for violations of the real II-62 limitations. Found results are specified with time or time range when the violation occurred and the type of violation is listed.

At the bottom of the result window, a summary of found results related to specific subjects and the total number of violations are displayed

Use this feature to learn about the real limitations, to optimize your piloting techniques and to find out reasons for incidents. On the next page, you find all items to be checked and their specific limitations.

List of checked items, corresponding to the limits in the real Il-62 (at the moment adapted from Tu-154 limitations) :

Parameter Limitation

1. Excess of speed at altitudes 0 ... 7000 m of 600 km/h
2. Excess of speed at altitudes > 7000 m of 575 km/h
3. Excess of speed with flaps 15 : 420 km/h
4. Excess of speed with flaps 28 : 360 km/h
5. Excess of speed with flaps 45 : 300 km/h
6. Excess of speed at gear retraction / extension of 400 km/h
7. Excess of speed with slats of 425 km/h
8. Minimum speed in clean configuration of 320 km/h
9. Minimum speed flaps 15 (at weight 72t) of 289 km/h
10. Minimum speed flaps 28* (at weight 72t) 271 km/h
11. Minimum speed flaps 45* (at weight 72t) 255 km/h
12. Excess of allowable positive G-Loads +2,5 units.
13. Excess of allowable negative G-Loads -1,0 units.
14. Definition of a rough contact (overload at compressed racks) : +1,5 units.
15. Excess of allowable bank angle 32 deg.
16. Excess of allowable bank angle during takeoff
(determined on flaps in a range 5 ... 28, IAS less than 340 km/h and vertical speed more than 2 m/s),
17. Excess of allowable bank angle on landing
(it is determined by flaps more than 28, IAS less than 280 km/h)
18. Excess of allowable bank angle at altitudes less than 250 m
19. Excess of allowable vertical speed, descent 30 m/s
20. Excess of allowable vertical speed of 5,5 m/s, descent at altitudes less than 600 m
21. Excess of an allowable vertical speed of 1.6 m/s, descent at altitudes less than 250 m with retracted landing gear.
22. Extension of spoilers on glide path (determined on altitude with PB-5 less than 600 m and the Flaps extended)
23. Excess of speed on takeoff run of 300 km/h
24. Ballooning at touchdown (it is determined on an altitude with PB-5 less than 6 m, a positive vertical velocity, and extended landing gear)
25. Use of AT during climb, cruise or descent (determined on switched on AT in the modes V or M and IAS more than 450 km/h)
26. Use of AT on glide path at CAT-I approach.. In flight director mode (determined on activation of an AP approach mode). And switches прод or the modes «штурв» or «выкл» and an altitude with PB-5 less than 250 m)
27. No landing configuration (determined by an altitude with PB-5 less than 250 m, negative vertical velocity, and any condition from the following : flaps not extended to positions 15, 28, 45 or retraceted gear or open locks of center spoilers)

5.4. The Cyrillic Alphabet

Groß Big	Klein small	wissenschaftliche Transliteration	deutsche Transkription	english Transcript
А	а	A a	A a	A a
Б	б	B b	B b	B b
В	в	V v	W w	V v
Г	г	G g	G g ⁸	G g
Д	д	D d	D d	D d
Е	е	E e	E e (Je je)	E e (Ye ye)
Ё	ё	ë ë	Jo jo (O o)	E e (auch Yo yo)
Ж	ж	Ž ž	Sch sch (Sh sh)	Zh zh
З	з	Z z	S s	Z z
И	и	I i	I i	I i
Й	й	J j ⁴	J j	Y y
К	к	K k	K k (aber: x statt ks)	K k
Л	л	L l	L l	L l
М	м	M m	M m	M m
Н	н	N n	N n	N n
О	о	O o	O o	O o
П	п	P p	P p	P p
Р	р	R r	R r	R r
С	с	S s	S s	S s
Т	т	T t	T t	T t
У	у	U u	U u	U u
Ф	ф	F f	F f	F f

Groß Big	Klein small	wissenschaftliche Transliteration	deutsche Transkription	english Transcript
X	x	Ch ch	Ch ch	Kh kh
Ц	ц	C c	Z z	Ts ts
Ч	ч	Č č	Tsch tsch	Ch ch
Ш	ш	Š š	Sch sch	Sh sh
Щ	щ	Šč šč	Schtsch schtsch	Shch shch
Ъ	ъ	" (-) (Härtezeichen)	(-)	(-)
Ы	ы	Y y	Y y	Y y
Ь	ь	' (-) (Weichheits- zeichen)	(J) (j)	(Y) (y)
Э	э	È è	E e	E e
Ю	ю	Ju Ju	Ju ju	Yu yu
Я	я	Ja ja	Ja ja	Ya ya

Changes for version 1.0 (since public beta/test version)

From beta version up to version 1.0 the basic attention was given to bug correction. Main purpose was to achieve reliability and convenience of operation.

1. The load system has been changed. Passengers are not simulated by fuel tanks anymore ☺
2. Dynamics have been modified. In particular engine thrust at idle has been reduced, the plane now does not accelerate at taxiing with idle thrust.
3. Control of the forward landing gear has been modified.
4. The panel system has been improved and expanded..
5. Spontaneous opening of refueling panels has been eliminated
6. The throttle panel has been added. The panel can be opened using an invisible clickspot at the bottom right corner of Captain and Navigator panel. Basic purpose of this panel is an opportunity of stop valve control. Stop valves are closed by moving throttles to extreme back position (mouse !).
7. For HB-ПБ navigation the standard maneuver mode (rectangular approach pattern) has been added.
8. The virtual navigation assistant (БПНН) has been added. It can be opened using the “БПНН” icon on the Captain and Navigator panel. At active БПНН the icon changes to green. In Waypoint mode БПНН works similar to the Tu-154B. In the main orthodromy mode it works only at flight under the program entered on the board P-31-4. БПНН in this case counts ЛПР and ППНМ switches programmed on the board P-31-4.
9. With the purpose of simplification of piloting by one crew member the РСБН azimuth index has been added on the Captains panel. The panel can be opened using a mouse clickspot in the top left corner, also repeaters of NV-PB counters are added. It allows to see coordinates of the plane in main orthodromy at landing approach in mode ГО.
10. New Copilot panel bitmap, thanks to George Suhii and Dmitry Dobronravinu. In the PANEL folder an alternative Captain panel bitmap is available (62_MAIN_1.bmp). Just exchange with 62_MAIN.bmp according to your preference.
11. The autopilot has been modified with the purpose of smoother control. The Autoland algorithm has been improved in turbulent conditions.
12. The Autopilot Go-Around mode has been added, actuated by a Joystick button.
13. Several bugfixes related to e.g. false operations of the signal system, ППНН navigation mode, wrong panel inscriptions, I-21 errors..
14. TCAS now works in online mode. The error of altitude definition definition for TCAS has been eliminated.
15. Opportunities of adjustment of axes and buttons of the Joystick service device have been expanded.
16. The plane intercom system СПВ has been modified. Switching of COM1 – COM2 using Joystick buttons is now possible.
17. The APK-15 units have been completely altered (improvement of beacon acquisition and audible IDENT).