



INVESTMENTS IN EDUCATION DEVELOPMENT

Course: **FIRE CONTROL**

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1) The Fundamentals of the firing activity of artillery units

accuracy of fire

The precision of fire expressed by the closeness of a grouping of shots at and around the centre of the target.

acknowledgement

A message from the addressee informing the originator that his communication has been received and is understood.

add

In artillery and naval fire support, a correction used by an observer/spotter to indicate that an increase in range along a spotting line is desired.

adjust fire

In artillery and naval fire support:

1. A method of control transmitted in the call for fire by the observer or spotter to indicate that he will control the adjustment.
2. An order or request to initiate an adjustment of fire.

adjustment of fire

Process used in artillery and naval fire to obtain correct bearing, range and height of burst (if time fuzes are used) when engaging a target by observed fire. Related term spot.

advance force

A temporary organization within the amphibious task force which precedes the main body to the objective area. Its function is to participate in preparing the objective for

the main assault by conducting such operations as reconnaissance, seizure of supporting positions, minesweeping, preliminary bombardment, underwater demolitions, and air support.

advanced base

A base located in or near a theatre of operations whose primary mission is to support military operations.

adversary

A party acknowledged as potentially hostile to a friendly party and against which the use of force may be envisaged.

airburst

An explosion of a bomb or projectile above the surface as distinguished from an explosion on contact with the surface or after penetration. Related term type of burst.

air observer

An individual whose primary mission is to observe or take photographs from an aircraft in order to adjust artillery fire or obtain military information.

altitude

The vertical distance of a level, a point or an object considered as a point, measured from mean sea level. Related term absolute altitude; altitude datum; barometric altitude; calibrated altitude; critical altitude; cruising altitude; cruising level; datum level; drop altitude; elevation; height; high altitude; minimum safe altitude; pressure-altitude; transition altitude; transition level.

artillery fire plan table

A presentation of planned targets giving data for engagement. Scheduled targets are fired in a definite time sequence. The starting time may be on call, at a prearranged time or at the occurrence of a specific event.

artillery manoeuvre area

An area within which artillery is authorized to deploy but which is not reserved for its exclusive use.

artillery preparation

Artillery fire delivered before an attack to disrupt communications and disorganize the enemy's defence.

artillery reserved area

An area reserved exclusively for the positioning of artillery assets.

artillery survey control point

A point at which the coordinates and the altitude are known and from which the bearings/azimuths to a number of reference objectives are also known.

assign

1. To place units or personnel in an organization where such placement is relatively permanent, and/or where such organization controls and administers the units or personnel for the primary function, or greater portion of the functions, of the unit or personnel.
2. To detail individuals to specific duties or functions where such duties or functions are primary and/or relatively permanent. Related term attach.

at my command

In artillery and naval fire support, the command used when it is desired to control the exact time of delivery of fire.

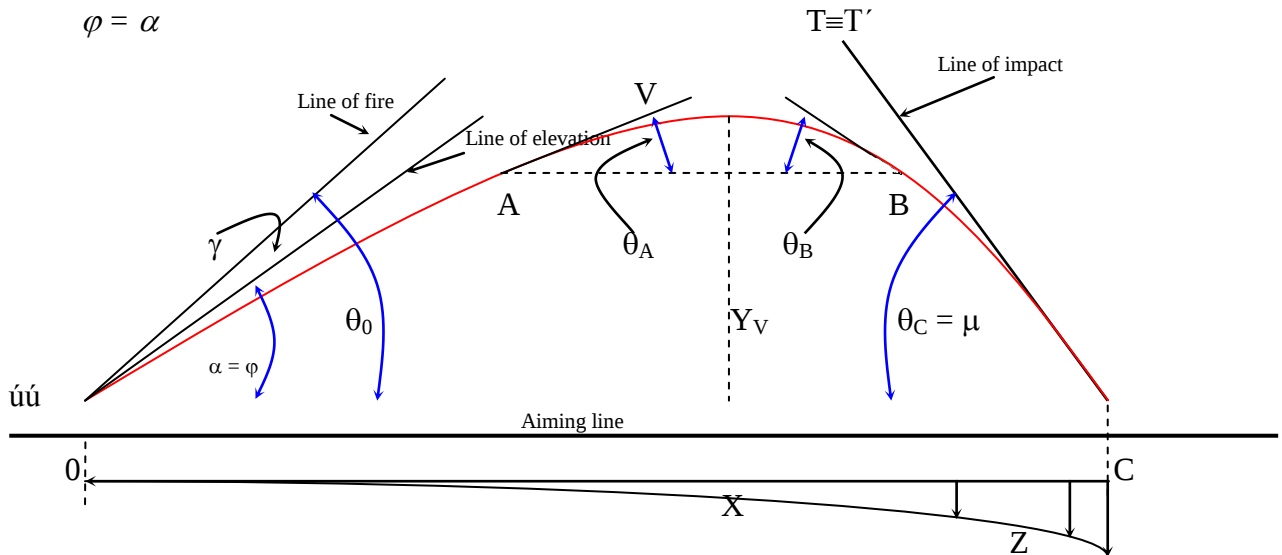
attach

1. To place units or personnel in an organization where such placement is relatively temporary. Subject to limitations imposed in the attachment order, the commander of the formation, unit, or organization receiving the attachment will exercise the same degree of command and control thereover as he does over the units and persons organic to his command. However, the responsibility for transfer and promotion of personnel will normally be retained by the parent formation, unit, or organization.

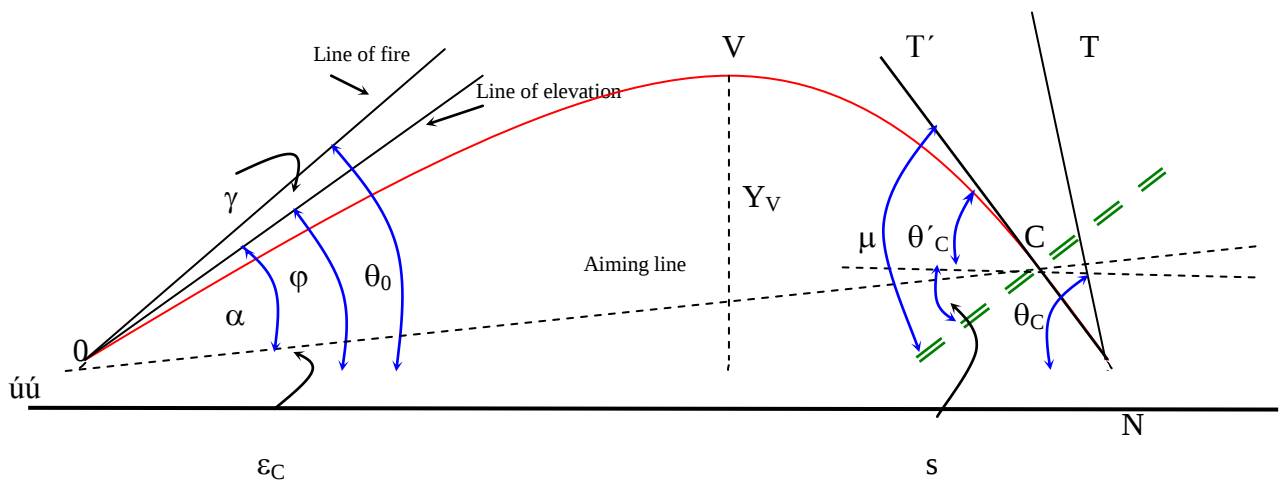
2. To detail individuals to specific functions where such functions are secondary or relatively temporary, i.e., attach for quarters and rations, attach for flying duty. Related term assign. 1/3/81

1.1 The trajectory of artillery projectiles

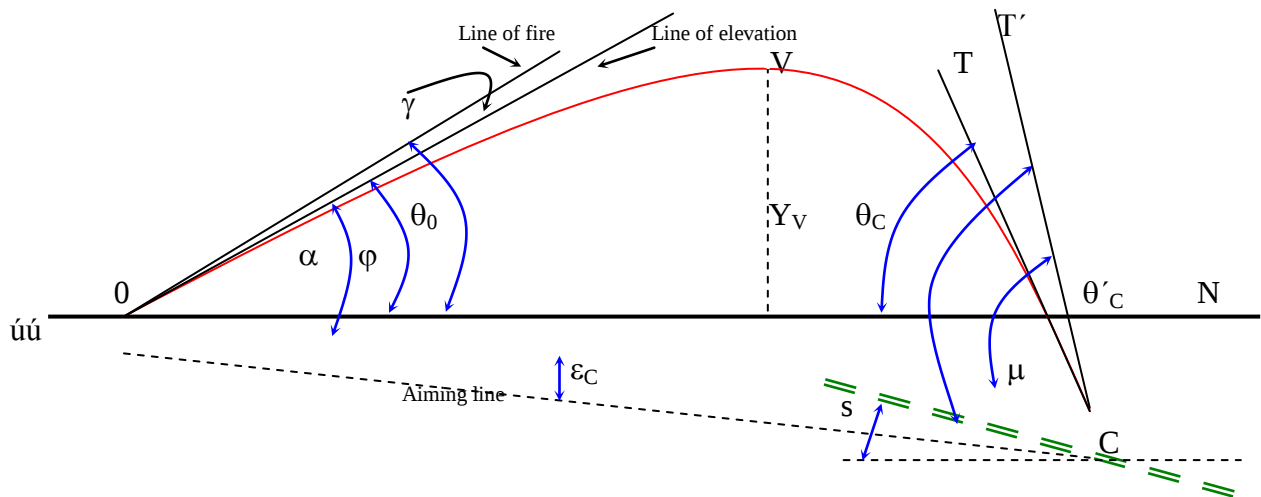
- target in the muzzle level
 $\varphi = \alpha$



- surmounted target – forward slope
 $\varphi = \alpha + \varepsilon + \Delta\alpha_\varepsilon$
 $\varphi = \alpha + \Delta\varphi \Rightarrow \Delta\varphi = \varepsilon + \Delta\alpha_\varepsilon$



- lowered target – slope averted
 $\varphi = \alpha - \varepsilon_C - \Delta\alpha_\varepsilon \quad \mu = \theta_C - s$
 $\varphi = \alpha - \Delta\varphi \quad \Rightarrow \quad \Delta\varphi = \varepsilon + \Delta\alpha_\varepsilon$



On pictures is described flight base line to the vertical plane, where:

- O - origin of fire; a middle of the muzzle
- α - aiming angle; angle between line of elevation and aiming line
- φ - elevation; angle between muzzle level and line of elevation
- θ_0 - angle of departure; angle between the muzzle level and line of departure
- γ - angle between line of elevation and line of departure
- ε_C - angle of site; angle between the muzzle level and aiming line
- Y_V - vertex height
- V - vertex of the trajectory
- θ_C - angle of descent
- s - angle of slope
- θ'_C - terminal angle
- T - tangent to the flight path in level point
- T' - tangent to the flight path in target point (impact)
- μ - angle of impact
- N - level point
- C - target (point of impact, fall)
- $\acute{u}\acute{u}$ - muzzle level
- Z - drift; size of the side deviation of level point in ground plane from plane of fire. It's cause is projectile rotation around its longitudinal axis in flight.
- OC - aiming line; line connecting origin of fire with target
- ON - line of elevation; aimed cannon axis of the barrel direction
- OV - line of fire; axis of the barrel direction in the moment of fire (aiming line is dissenting with line of elevation)

Angle θ_C characterize trajectory curvature. In dependence on the trajectory curvature we classify these projectile trajectories:

- flat trajectory with elevations to 20°
 - round trajectory with elevations from 20° to 45°
 - steep trajectory with elevations bigger than 45° (fire with superior group of angles)
- } (fire with inferior group of angles)

1.2 SAFETY AND RISK SAFETY DISTANCES

Safety distances (minimal) depend on:

- errors of determining the firing data in the distance
- projectiles dispersion,
- radius of the effective spray.
-

$$L_{MSD} = 4Ex_V + r_{str} \text{ nebo } L_{MSD} = 4\sqrt{Ex^2 + \dot{u}d^2} + r_{str} \quad (Ex_V^2 = Ex^2 + \dot{u}d^2)$$

where:

- Ex_V - probable error of fire,
- Ex - probable error of determining the firing data in the distance (long-range),
- r_{str} - maximal radius of the effective spray,
- $\dot{u}d$ - probable range deviation,
- L_{MSD} - minimal safety distance.

If the troops are in ditches, tanks, armored vehicles, r_{str} is neglected.

When firing with proximity time fuse then is $\dot{U}d$ replaced for $\dot{u}d$.

Minimal safety distances (meters) if the 152mm ShKH vz. 77 is firing without registration fire for distances to and above 10 kilometers and after registration fire (adjustment of the first round of effective fire):

Character of concealment of own troops	Projectile and fuse type											
	OF-540, striking (OF-843)			OF-540, proximity			OFd, striking (OFd)			OFd, proximity		
	To 10 km	Above 10 km	After reg. fire	To 10 km	Above 10 km	After reg. fire	To 10 km	Above 10 km	After reg. fire	To 10 km	Above 10 km	After reg. fire
In tanks			200			300			300			400
In ditches, IFV, in another armored vehicles	400 (400)	600 (500)	300	500	600	400	500 (500)	600 (500)	400	600	700	500
Exposed troops	600 (500)	800 (600)	400	700	800	500	600 (600)	700 (600)	500	800	900	600

- Data in the brackets are valid for distances to and above 4 km for 120mm M vz. 82 (120mm ShM vz. 85), values after registration fire are as the same as for 152mm ShKH vz. 77, for 82mm M vz. 52 distances can be lowered by 100 meters.
- 122mm RM vz. 70 can fire on targets in minimal distance of 1000 meters from own troops regardless the range of fire.

Risk safety distances are considered in war. They indicate warning, not restriction, they mean

direct danger to own troops located in given distances and commanders use it for taking appropriate steps. Risk safety distance is distance (m) from expected middle of splashes (bursts), when the certain degree of risk (vulnerability) and loss of own troops won't be overruled. It can be expressed as Probability of Incapacitation (PI - in %) to relative firing distance $D_{\max}$.

Risk safety distances:

Weapon, projectile and fuse type		PI – 10%			PI – 0,1%		
		$\frac{1}{3} D_{\max}$	$\frac{2}{3} D_{\max}$	$D_{\max}$	$\frac{1}{3} D_{\max}$	$\frac{2}{3} D_{\max}$	$D_{\max}$
152mm ShKH vz. 77	OF-540, striking	100	125	150	200	280	450
	OF-540, proximity	125	145	175	230	290	465
	OFd, striking	150	180	200	280	300	475
	OFd, proximity	195	235	275	365	390	520
82mm M vz. 52	O	75	85	100	165	185	230
120mm M vz. 82	OFd, OF, OF-843	85	100	125	175	200	300
122mm RM vz. 70	JROF	700	500	300	800	600	500

1.3 ARTILLERY COMMANDS ABBREVIATIONS

C.n.	Meaning	Abb	C.n.	Meaning	Abb
1	ballistic adjustments	bo	63	unit of fire	papr
2	gun tier	bat	64	infantry	pech
3	gun tier ready	batp	65	standing-by (done)	hot
4	close to own troops	bvv	66	barrage fire	pp
5	close to target	bc	67	auxiliary target	pc
6	recoilless rifle	bzk	68	progressively concentrated fire	psp
7	compass	bus/buz	69	attention	!
8	target number JE1101	cJE1101	70	observation post	poz
9	training	cv	71	right	p
10	time/timing/platoon	c	72	antitank gun	ptk
11	indication	ct	73	frontage	pru
12	fourth cannon	4d	74	first platoon	1c
13	distance	da	75	armour-piercing	ptp
14	far from target	dac	76	high explosive	prup
15	cannon	d	77	anti-tank guided missile	ptrs
16	artillery battalion	do	78	radar	rl
17	joint artillery battalion	smdo	79	radio station	rst
18	artillery brigade	db	80	rocket launcher (rocket)	rm
19	mil	dc	81	rocket launcher gun tier	rmbat
20	over 50 (plus)	+50 (+)	82	rocket launcher platoon	rmc
21	to the left (left hand)	- (l)	83	rocket launcher battalion	rmo
22	to the right (right hand)	+(p)	84	hit	r
23	smoke	dym	85	4 hits time after time	4rn
24	hlásím (hlaste, hlášení)	hl	86	unfurl	roz
25	fiktivní pomocný cíl	fpc	87	volley fire	sa
26	main direction	hs	88	self propelled gun	shd
27	depth	hlo	89	north,(northern),	s,sv,sz
28	south,	j,jv,jz		northeast, northwest,	

	southeasterly, southwestly		90	close	sev
29	fire coefficient	kos	91	angle of strike	sm
30	machine gun	kul	92	coordinates	sou
31	short 80 (minus)	-80 (-)	93	consumption	spo
32	covered	kt	94	is firing	strl
33	level	li	95	scale (by scale)	st
34	left	l	96	width	si
35	meteorological	met	97	tank	t
36	mortar (mine)	min	98	disruptive (high- explosive)	th (tsth)
37	mortar	minbat	99	scatter (scatter and disruptive)	ts (tsath)
38	mortar platoon	minc	100	effective fire	us
39	place of command	mv	101	sheaf	vj
40	loaded/load	nb	102	unfurled sheaf	vjs
41	distributed fire	nlm	103	majority plus (minus)	+> (->)
42	charge, full charge,	n, npl	104	all plus (minus)	$\oplus$ (Θ)
43	reduced charge	nzm	105	above (high)	v
44	fourth charge	n4	106	air fictitious auxiliary target	vpc
45	impact	nr	107	sight	zaj
46	guiding device	nz	108	base line / west	z
47	uncovered	nkt	109	trench	zak
48	unobserved	?	110	incendiary	zap
49	incorrectly	nepr	111	delayed	zp
50	unexploded	nv	112	list as target	zjc
51	down (low)	n	113	hit	zs ($\pm$)
52	armoured carrier	ot	114	defect	zav
53	battalion	odd	115		
54	launching equipment	oz	116		
55	range marker	ob	117		
56	sharply	os	118		
57	illuminating	osv	118		
58	fire	pal	120		
59	shooting	pa	121		
60	end of mission	pst	122		
61	fire position	palpos t	123		
62	firing by surprise	pap	124		

1.4 Principles of ranking the targets with artillery battalion and battery

Methods of ranking group orthogonal (linear) targets with artillery battalion and battery

Performer	Method of ranking	Targets, projectiles, fuses
Artillery battalion (concentrated fires of battalion)	with batteries by double concentration	- shooting with high explosives projectiles with impact (proximity) fuses - shooting on individual unobserved and group unobserved and observed targets
	with batteries stepwise	- shooting with high explosives projectiles with delayed action fuse - shooting on convoys
	with distribution the targets among batteries	- shooting on targets, which are need to be disabled in the same time
	with distribution the sections of targets (lines) among batteries	- shooting on targets with sizes bigger then maximal section for battalion or on target which has irregular elongated shape and we know the coordinates of the most important elements - application of defensive barrage fires
Artillery battery (separated fires of batteries)	by double concentration	- shooting on individual unobserved and group unobserved and observed targets
	with platoons by double concentration	- shooting on group observed targets with 100 meters bigger depth
	with platoons stepwise	- shooting with high explosives projectiles with delayed action fuse
	with distribution of the targets among platoons	- shooting on targets, which are need to be disabled in the same time
	with distribution the sections of targets (lines) among platoons	- shooting on targets with sizes bigger then maximal section for battery or on target which has irregular elongated shape and we know the coordinates of the most important elements - application of defensive barrage fires

With culling the ring-type targets is proceeded by special rules and is realized only for calculation the firing data with computer support.

ARTILLERY BATTALION, BATTERY (PLATOON) APPLY THE FIRE ON TARGETS WITH SIZES UP TO THE MAXIMAL SECTION FOR BATTALION, BATTERY (PLATOON).

2 The Simplified preparation

Elements for simplified shooting training are determined graphically, and then only in exceptional cases, the firing battery. The procedure is as follows (Figure 2.4).

The device for fire control or map (digital RETM), according to coordinates (also estimated) draws an observation. From the vantage Plot guideline. Compass or other encoder device is measured in the field from the vantage horizontal angle between the main direction and the direction of the firing battery position. Horizontal angle is plotted from the main direction in the direction of the firing position and draws a straight line. Estimated (in the case of line of sight rangefinder) is determined by distance firing position and the corresponding scale is plotted point firing position. From the point of firing position with the main draws a straight line parallel to the line plotted from the vantage point.

After finding the target from the vantage angle α measured from the main direction of the goal and draws a line in the direction of the target. Rangefinder is determined or estimated viewing distance, which is plotted on an appropriate scale on the line, plotted from the vantage point in the direction of the target and mark the point targets.

Elements of fire and other data needed for shooting goals are determined by general rules. Corrections for changes in ballistic and meteorological conditions and altitude targets are included only approximately.

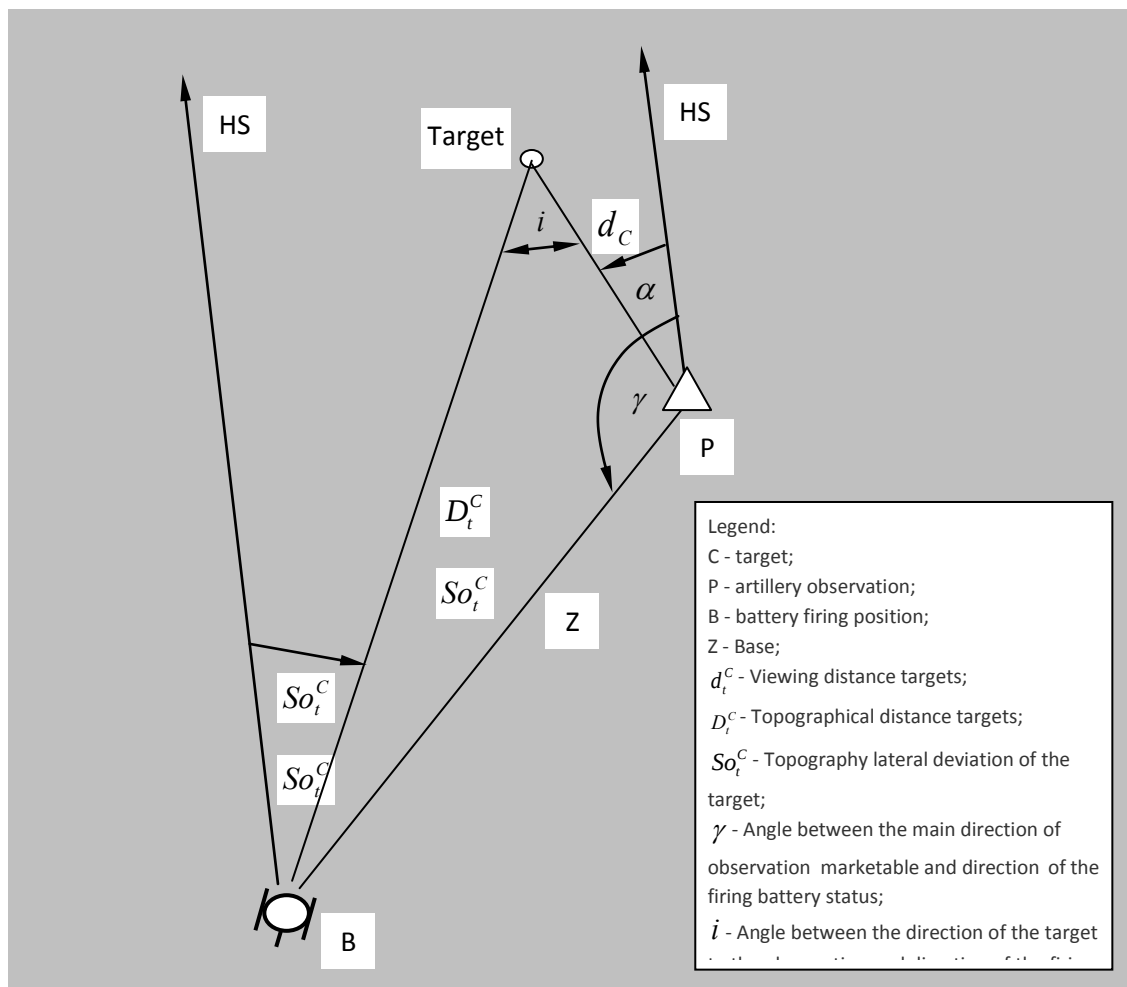
After shooting targets are calculated shooting repair distance and direction, which are used in the preparation of elements for shooting at a new target.

If the viewing angle can be calculated to determine the elements of the new destination without the need for this objective draw device for fire control, map or planšet.

This is necessary:

determine the difference from the vantage point of distance to the phased out target and change this value shooting sight distance, the calculated distance is obtained by sighting the new target;

from the vantage point to measure the angle between shooting and the new target, multiply it by reducing the ratio to correct lateral jump and change this value shooting side deviation, calculated to obtain the lateral deviation of the new target.



2.1 Fire tasks characteristics (Fires) according to required Firing effect (level of target's ELimination)

a) Fire tasks with lethal effect

Fire task (basic level of target's elimination)	Fire task characteristic (level of target's elimination)	Firing effect	Level of target's elimination (expected firing effect)
DESTROY	- To cause immediate irretrievable people losses or such material (functional) damage of combat arms, which disables target from action and other combat use for long time (6-12 h) or permanently; target loses (permanently) his combat efficiency (operability). - Complete loss of combat efficiency is reached with simultaneous affecting of physical and psychological people losses or material losses of combat arms altogether with reach of functional disability.	Lethal (non-lethal too)	$M(a) \geq 35\%$ (max. 50%) On individual unobserved target: - probability of elimination (for destroy) $P_z = 0,7 - 0,9$.
SCOTCH	- To cause such physical and psychological people losses, material losses of combat arms, which exclude the fulfilling of target's tasks during application of fire and partially after completion of fire (1-3 h; to getting 50 % of primary combat potential); target loses his combat efficiency temporarily.	Lethal (non-lethal too)	$M(a) \geq 20\%$ (max. 35%) On individual unobserved target: - probability of elimination (for scotch) $P_u \geq 0,5$.
FRUSTRATE FIRE	- To cause limited physical and psychological people losses and material losses of combat arms, which make target's activities more difficult or disable the target to do those activities during application of fire; the target loses his combat efficiency only for time of firing by surprise.	Lethal (non-lethal too)	$M(a) \geq 3\%$ (max. 10%)
DEMOLISH	- To demolish (physical destruction) the target (object); the target loses completely (permanently) combat efficiency (combat use), reason or function.	Lethal (non-lethal too)	As for destroy.

b) Fire tasks with non-lethal effect

Fire task (basic level of target's elimination)	Fire task characteristic (level of target's elimination)	Firing effect	Level of target's elimination (expected firing effect)
BOTHER	- To bother units in areas of concentration and in final assembly areas. - To isolate units and to disrupt the movement of units under threat of losses. - To influence negatively and to lower the morale of units. - Before realisation of this kind of fire, it is necessary to consider all aspects of fire-control first (especially tactical aspects). - This kind of fire causes almost usual (standard) operational load of own fire units and danger of opposition against own units as well (enemy fire).	Non-lethal	Specific effect. Lethal (material, physical) effect on the enemy is small, it can be multiplied by real tactical situation (circumstances).
SMOKE	- To create (short term or permanent) smoke screen for screening individual (group) enemy object with intention to disable it's observing or navigation. - To create smoke screens for screening the manoeuvre or another activity of own troops.	Non-lethal	Specific effect.
LIGHT UP	- To light up flammable material in the target area with incendiary (high explosive, illuminating, smoke) projectiles.	Non-lethal (lethal too)	Specific effect. Eventual lethal (physical) effect is reached by acting of fire.
ILLUMINATE	- To create conditions, so it is possible to detect the target with reconnoitering device in night and observe process of registration fire, appropriately results of effective fire.	Non-lethal	Specific effect.
BLIND	- To blind the enemy target and disable his observing.	Non-lethal	Specific effect.
MARK	- To mark the target (area) for action of helicopter or tactical aircraft.	Non-lethal	Specific effect.

2.2 Methods of firing data assessment and their accuracy

Methods of effective firing data assessment

According to frequency of use	According to accuracy
- Full preparation - According to results of establishment (registration fire) of fictitious (real) auxiliary targets: • use of ranging canons • transfer of fire off auxiliary targets - Shortened preparation - Simplified preparation - Registration fire	- Registration fire - Transfers of fire off auxiliary targets - Full preparation - Use of ranging canons - Shortened preparation - Simplified preparation

Methods of effective firing data assessment of artillery battalion and gun tiers and their accuracy

Canons and mortars		Rocket launcher		Probable error	
Battalion	Gun tier	Battalion	Gun tier	of distance (% D _t)	of direction (dc)
Full preparation	Full preparation ⁺	Full preparation	Full preparation	0,7 – 0,9 0,8 – 1,8 ⁺ 80-120m [‘]	0-03 – 0-05 0-05 – 0-10 ⁺ 0-05 – 0-06 [‘]
Use of ranging canons	-----	-----	-----	0,8 – 1,2	0-02 – 0-03
-----	Transfers of fire off auxiliary targets ^o	-----	-----	0,5 – 0,7	0-01 – 0-03
Shortened preparation ⁺⁺	Shortened preparation	Shortened preparation	Shortened preparation	1,4 – 6	0-07 – 0-20
-----	Simplified preparation	-----	-----	8 – 10	0-30 – 0-40
Target's fire registration	Target's fire registration	Target's fire registration [*]	Target's fire registration [*]	0,3 – 0,5	0-02 – 0-03

+ mortar gun tier – only if it has meteorological report METEO-MIDDLE

+ + only if at least two gun tiers are firing to schotch the group target and validity terms of full preparation (a. 172) are not executed at maximum of two points and is valid article 174

* only exceptionally

o with mortar gun tier only simple method

‘ rocket launcher gun tier (gun tier)

3 Determining the elements for fire due to of substitute instruments

3.1 Preparing equipment for fire control PUO – 9M

Procedure:

- case lay down a harness and handle together,
- open pouch and remove the device comprising grasping with both hands just above the horizontal arm,
- open upper half ruler (of 90 °) to the upright position by grasping the arm on the left side of the device,
- on the protractor to loosen the fixing screw (the curved part), turning left about $\frac{1}{4}$ and moving to the edge of the protractor (to himself) to remove him from the bed,
- open ruler (both halves in the horizontal position),
- ruler locks ensure against closure (inserting and turning the lock of 90 °),
- lay the device on a horizontal surface ruler up,
- horizontal extension ruler:
 - loosen the fixing screw on sledges,
 - pulled out a ruler to $\frac{1}{4}$ upper part (apart) ruler,
 - use of the right side of the protractor on the horizontal ruler extension (for easier insertion lift the fence about 1 mm),
- removed from the housing district ruler (with graphical firing tables) grip in the middle right hand lifted about 5 mm and the pressure on the upper left-hand end of the eject him from capture,
- on the protractor to release the screw remote ruler (to the extreme position) and deploy remote holes in the fence taper pins,
- ruler to consolidate remote locking screw.

The main part of the device PUO – 9M are shown in Fig. 22.

To further clarify the true data from the example given in the paper 3.2.1.

3.2 The main part of the device for fire control PUO – 9M

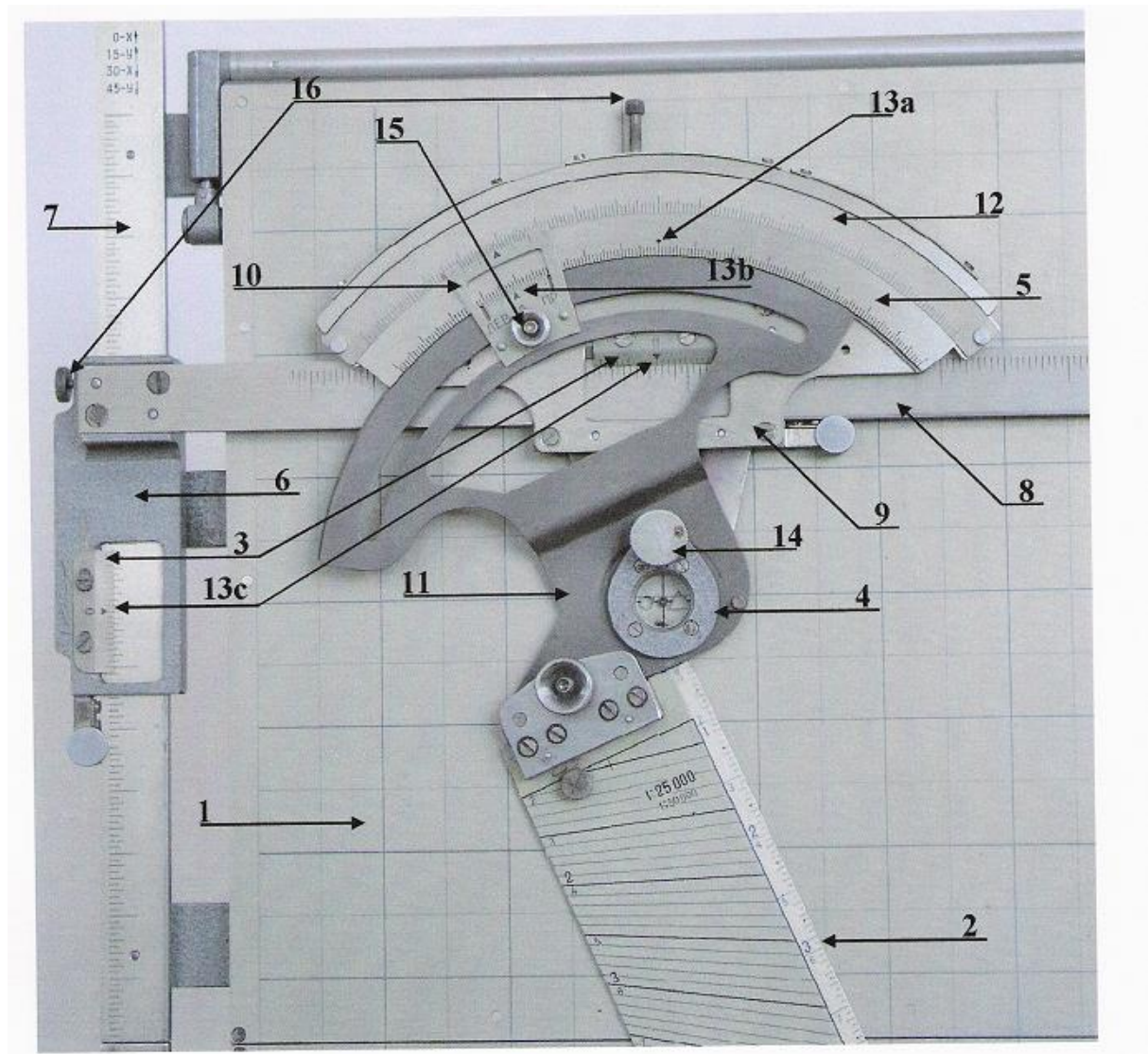


Figure 22 – The main part of the device for fire control PUO – 9M

1 – metal folding ruler	10 – tread with noni
2 – Remote ruler	11 – mobile segment
3 – Coordinate staging	12 – mobile scale
4 – central sleeve	13a – zero index of the protractor scale stationary
5 – immobile scale	13b – zero index tread noni
6 – sledge	13c – Chip index zero coordinates
7 – vertical extension ruler	14 – central locking screw bushings
8 – horizontal extension ruler	15 – locking screw tread
9 – sledge	16 – sledge locking screw

3.3 Control of device PUO – 9 M

a) Accuracy of the connection ruler:

- shift the zero index Chip coordinates to contact both halves ruler,
- disagree - if extreme mark noni with the vertical scale graduations discharging rulers, loosen the screws Chip coordinates and mark identified (identification of the lines shown in Fig. 23).

b) Noni on staging accuracy of rulers:

- move both sledges extension rulers in the top center of ruler,
- identify cross the intersection of the center housing with miles of lines,
- disagree - if extreme mark noni with extension rulers graduations, loosen the screws and mark staging coordinates identify.

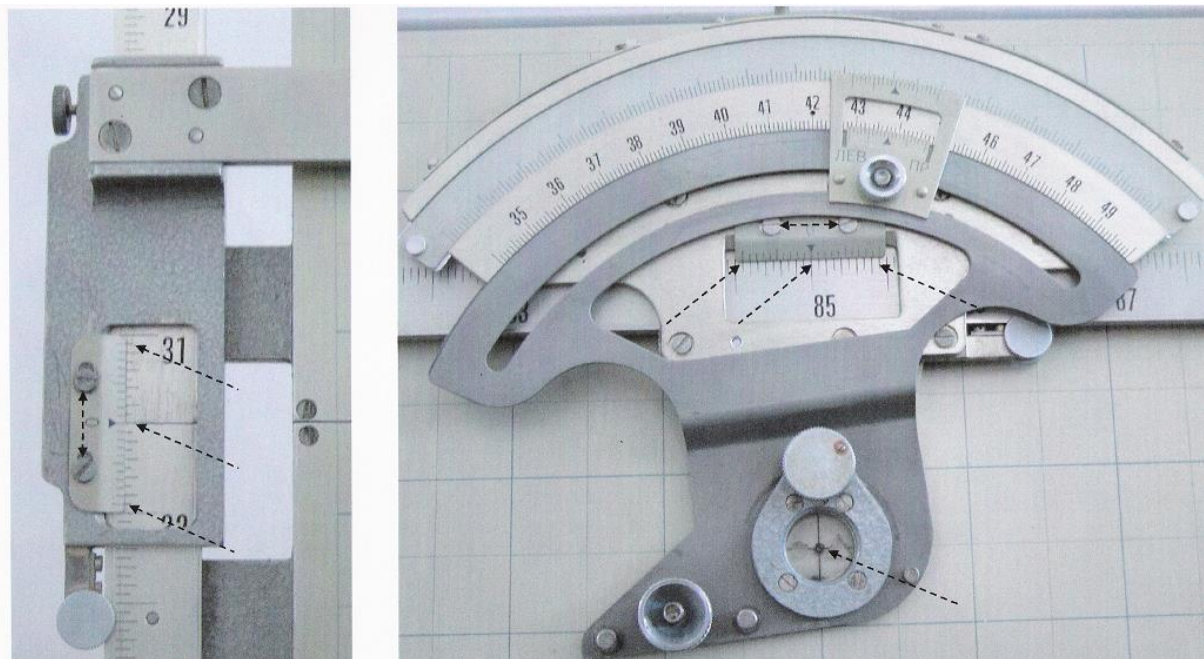


Figure 23 – Precision and accuracy link ruler noni extension to the rulers

3.4 Orientation ruler to the main direction

Procedure:

- Determine bearing vertical staging of the four rulers bearing (0-00, 15-00, 30-00, 45-00), which is closest to that bearing the main direction, ie. 45-00,
- draw the diagram at the end of the extension rulers in the upper left corner ruler of the coordinate axes direction N (X) and E (Y),
- write the zero index of the protractor scale stationary bearing the main direction (42-00) and numbered scale (determining the direction of coordinate axes and the numbering of the scale is shown in Fig. 24),

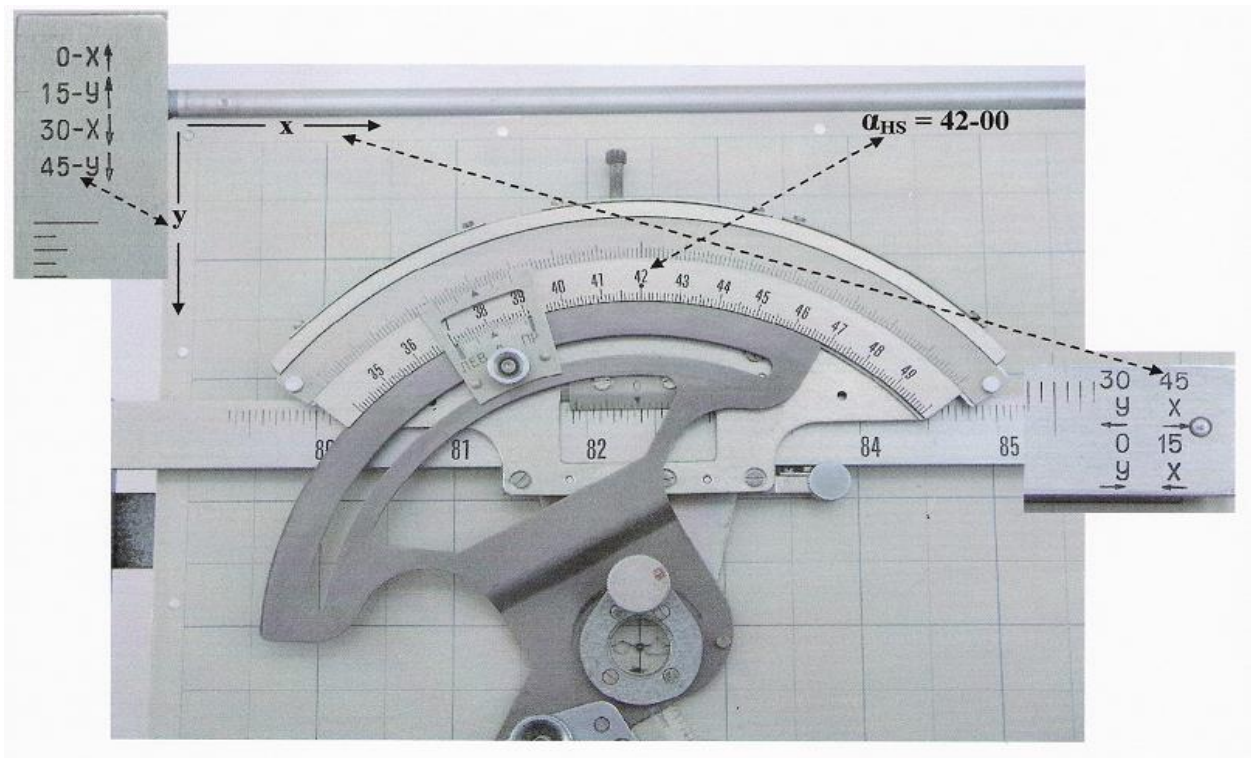


Figure 24 – Determining the direction of coordinate axes N (X), E (Y) and numbering protractor scale stationary

- remote edge ruler attached to any vertical line km at the top of ruler, and ensure the central locking screw bushings,

- move the runner with Noni so that the lower index Noni agreed with the value of bearing, 45-00 and tread with noni secure (matching remote rulers km vertical line and tread Noni is the value of bearing shown in Fig. 25),

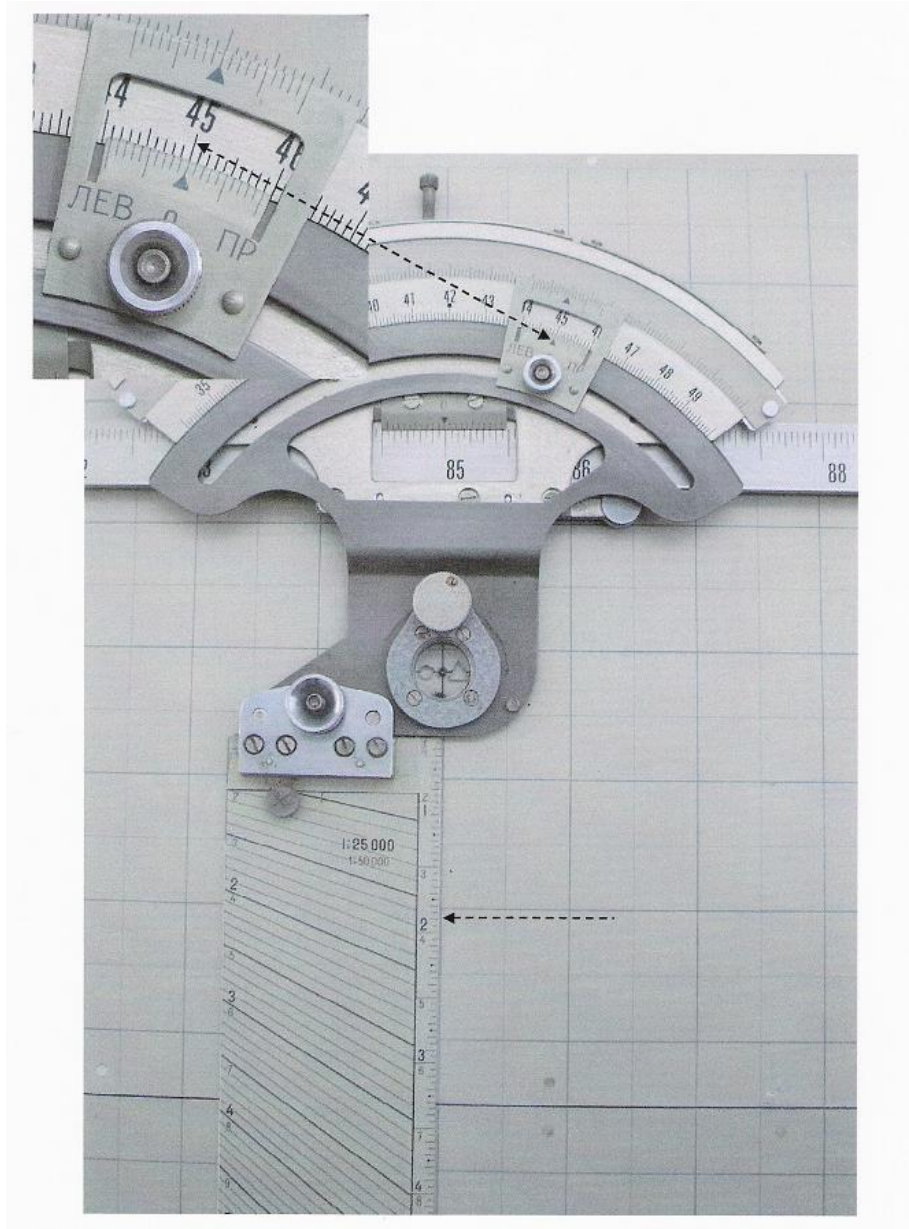


Figure 25 – Reconciliation of remote rulers km vertical line and tread with noni the bearing 45-00

- loosen the center locking screw sleeve, remote turn ruler to zero index lower Noni agreed to by the main bearing direction (42-00) immobile scale; long-distance ruler is

oriented into the direction α_{HS} (orientation of remote rulers to the main direction α_{HS} is shown in Fig. 26),

- provide remote ruler.

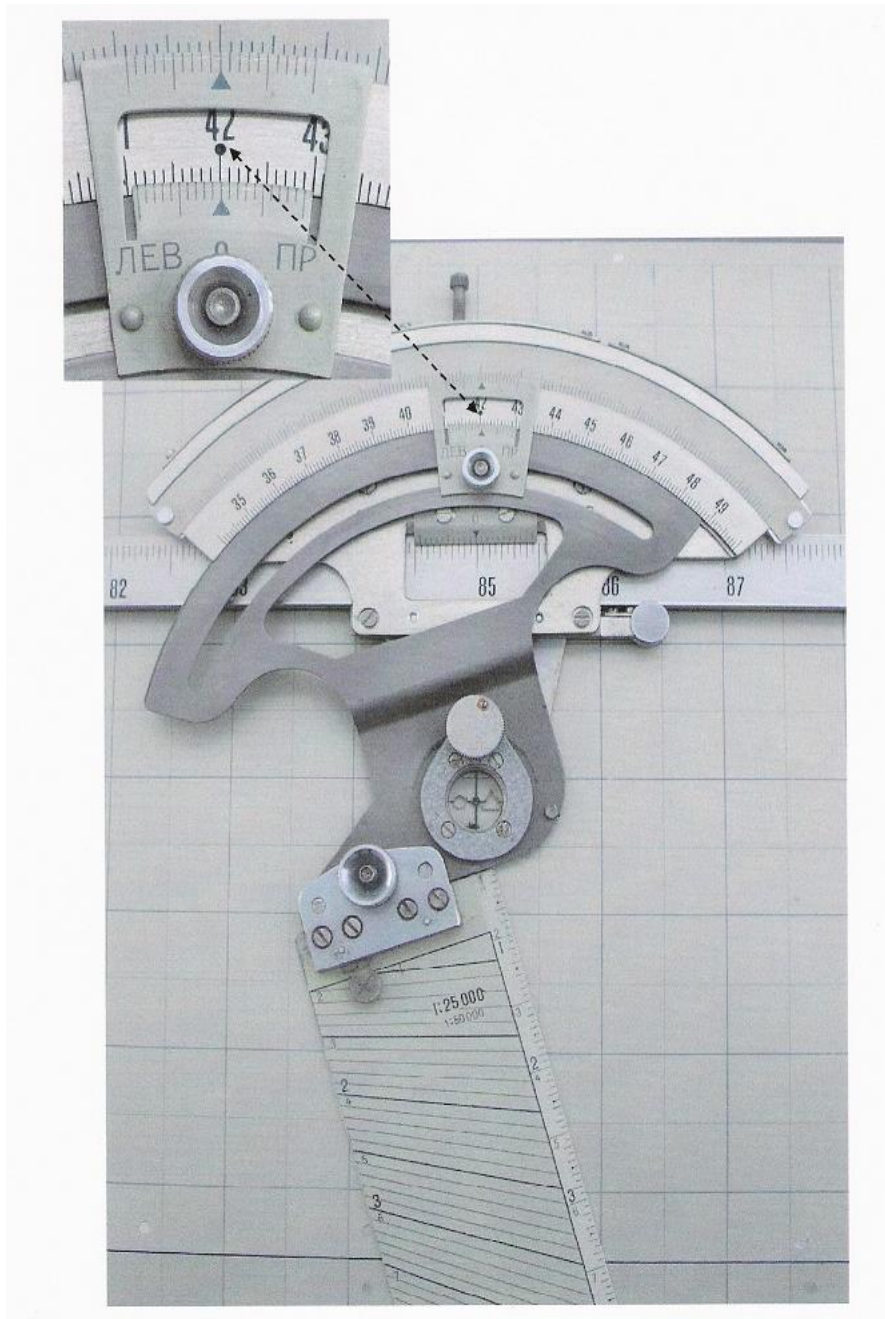


Figure 26 – Orientation remote rulers to the main direction α_{HS}

Numbering extension rulers

Procedure:

- the orientation of the remote to the main direction of the ruler α_{HS} to move the horizontal extension ruler to the center hole in the middle of the housing ruler miles to the third line above,
- choose the position of the remote ruler and square according to the firing range of the selected firing position (usually the second row from bottom), determine the square firing position and extension rulers numbering is shown in Fig. 27,
- numbered scale extension of rulers from the square of the selected firing position along the directions of coordinate axes N (X), E (Y),
- struck out of the noni, which are on the downward extension of the scales, rulers, and the example is used, identification of unused parts of the noni is shown in Fig. 28.

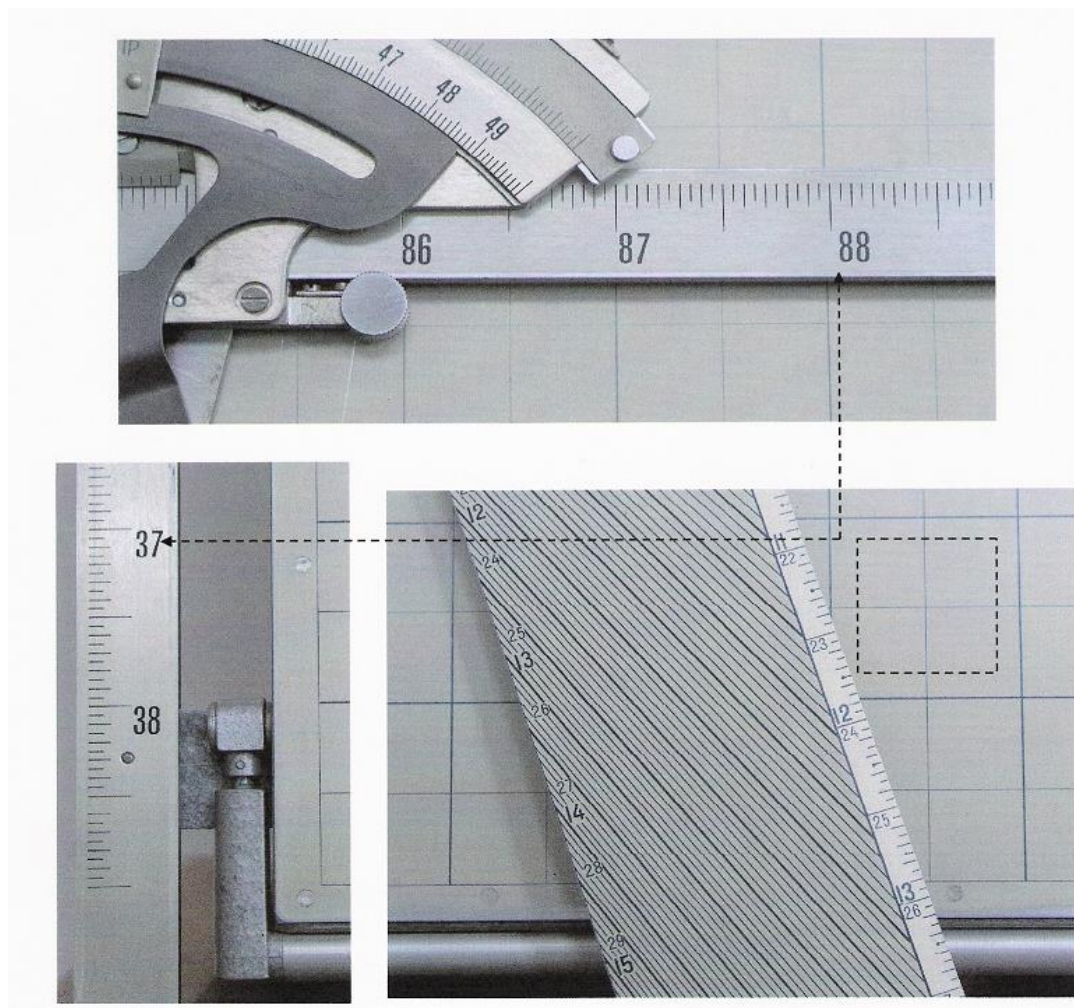


Figure 27 – Determining square firing position and numbering extension rulers

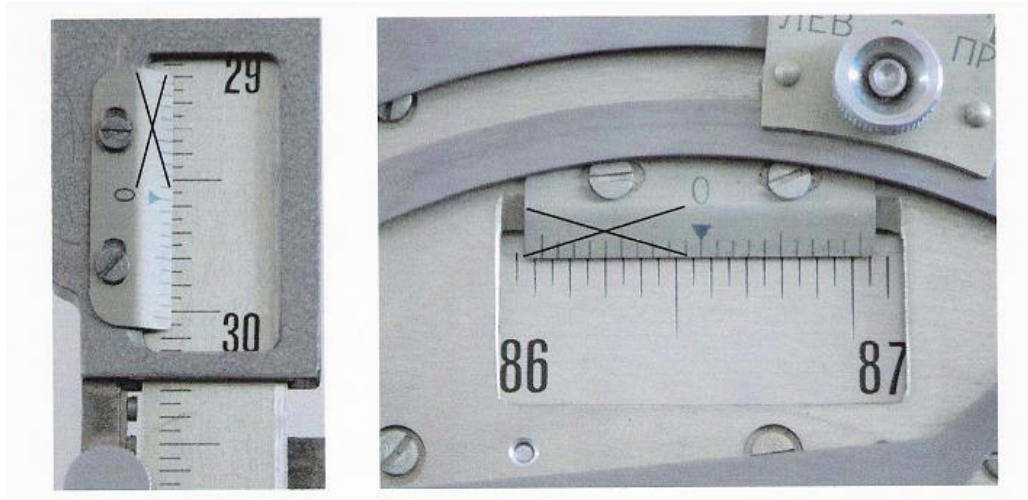


Figure 28 – Marking unused parts of the noni extension rulers

3.5 Plotting the elements of a military deployment

a) Coordinate delivery of the observation:

- coordinates N (X) observation:
 - identify the zero index Chip coordinates with the value 87 500
 - identify the zero index Chip coordinates with the value N (X) ,
 - at the scale 1 : 25 000 is a piece of noni to coordinate extension 5 m,
 - for the remaining 40 m true: $40 : 5 = 8$,
 - identify the eighth mark noni with the next line the discharging rulers,
 - total coordinate N (X) observation is 87 540.
- coordinates E (Y) observation:
 - identify the zero index Chip coordinates with the value 32 650 mark on the ruler staging axis E (Y),
 - for the remaining 20 m true: $20 : 5 = 4$,
 - identify the fourth mark noni with the next line the discharging ruler,
 - total coordinate E (Y) observation is 32 670.

Plotting the coordinates of N (X), E (Y) firing position in an identical manner according to set values for the firing position.

Plotting the coordinates of N (X), E (Y) observatory is shown in Fig. 29, plot coordinates firing position shown in Fig. 30.

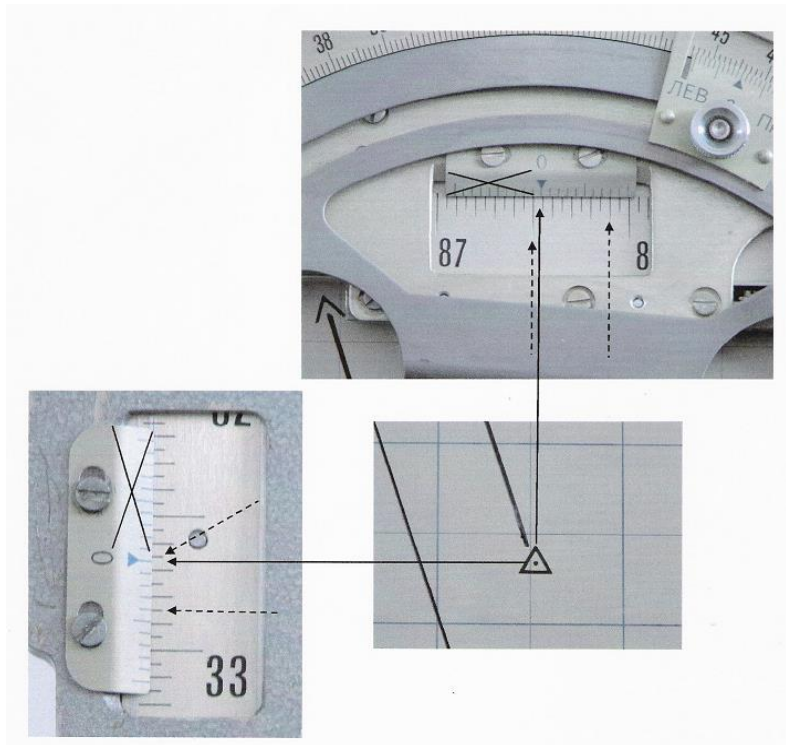


Figure 29 – Plotting the coordinates of N (X) , E (Y) observation

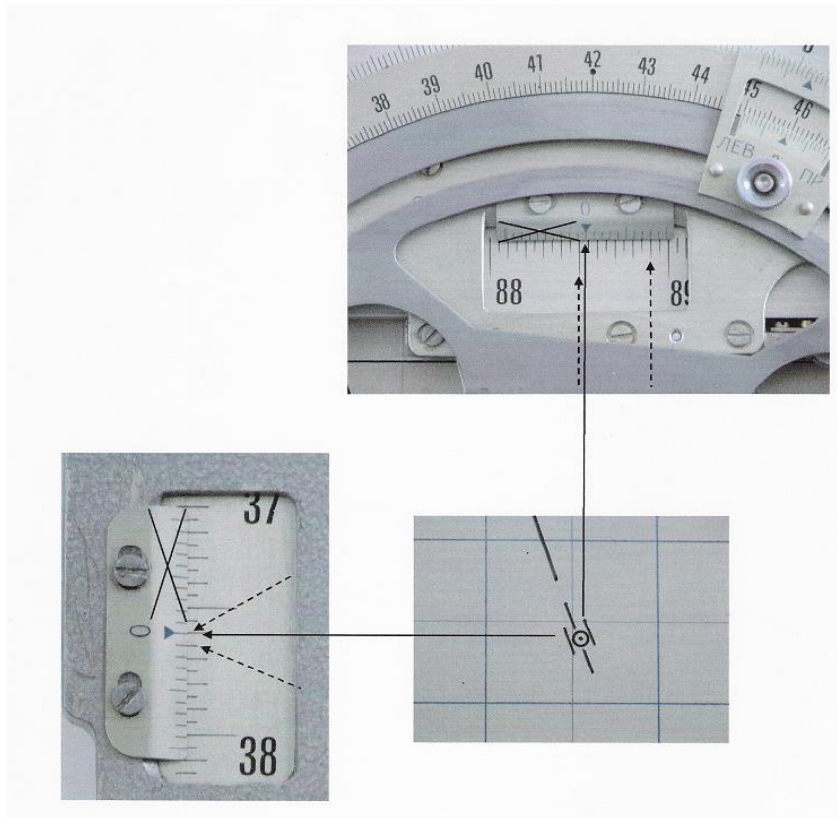


Figure 30 – Plotting the coordinates of N (X), E (Y) firing position

Plotting the target polar coordinates

For plotting angular values using mobile and immobile scale and tread with Noni. The scale is numbered after 1-00, each mark denotes 0-10 and piece of noni is 0-01.

The default values:

- $\alpha_c = 40 - 16$
- $d_c = 2875 \text{ m}$

Procedure:

- draw vantage point, a line parallel to the horizontal ruler staging (line led observation point is shown in Fig. 31)

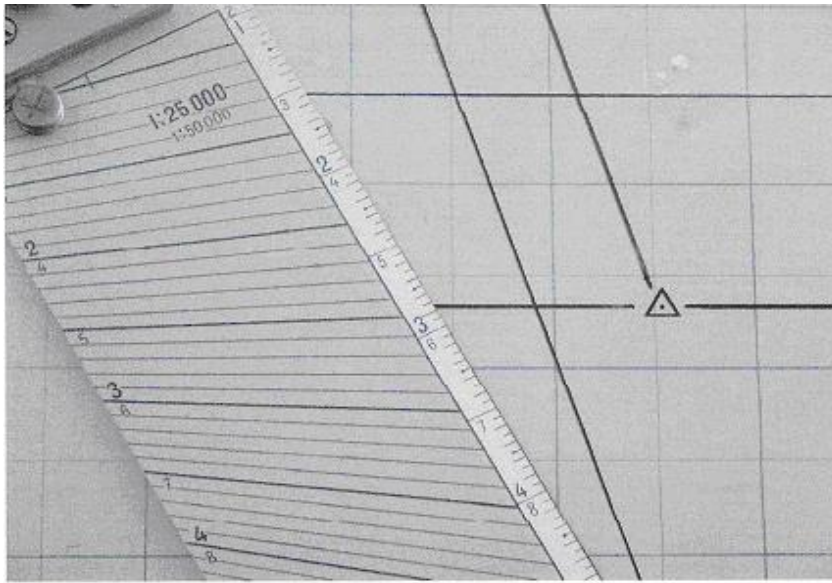


Figure 31 – Plotting a line through the point of observation

- remote turn ruler to zero index Noni agreed with the value 40 – 10,
- identify the sixth mark noni with the next higher line the sliding scale, which is set to the bearing 40-16 (the value of bearing is shown in Fig. 32),

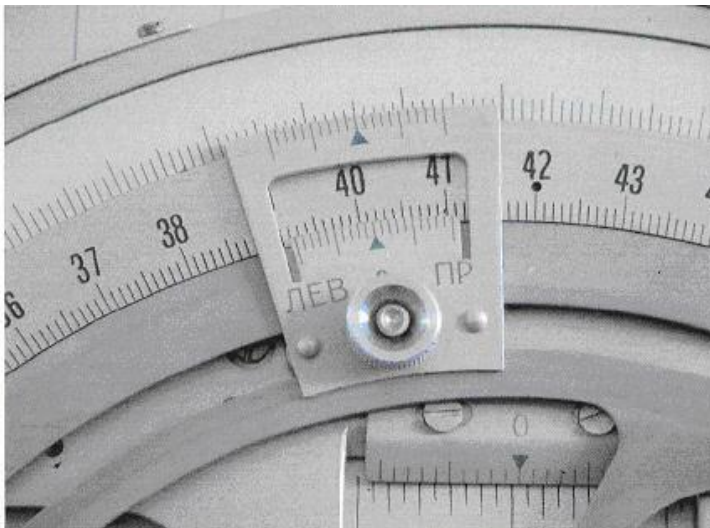


Figure 32 – Display the value of bearing

- shift sleds after staging a vertical ruler agree value of the remote distance ruler with sketched line (parallel plot),
- shift sleds after staging a horizontal ruler agree edge distance scales with the observation from which it was intended targets bearing and distance viewing target,
- bring the case to the center hole ruler point and mark it ring (delivery targets is shown in Fig. 33).

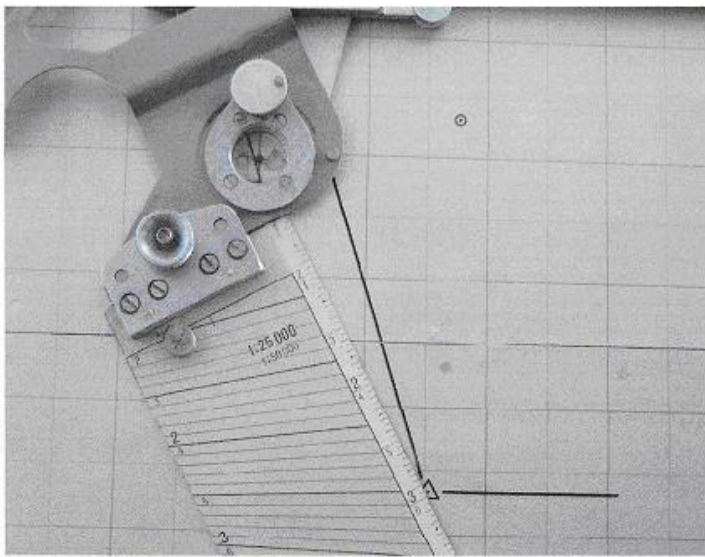


Figure 33 – Plotting the target polar coordinates

3.6 Determination of topographic features on the device for fire control PUO – 9 M

To prepare PUO - 9M for use are given in Annex 2. To determine the topographical features and other values is shown in Fig. 17, 18, 19, 20 and 21.

Example:

Initial data:

- coordinate observation:
 - x 87 540
 - y 32 670
- firing position coordinates:
 - x 88 540
 - y 37 605
- bearing the main direction α_{HS} :
 - 42-00

To determine the topographic features are as follows:

- motion for extension shoe ruler to set the center hole housing the protractor to the point indicating the target sled screws secure or bring goal rectangular or polar coordinates,
- remote turning the ruler attached to the edge of the working point indicate firing position,

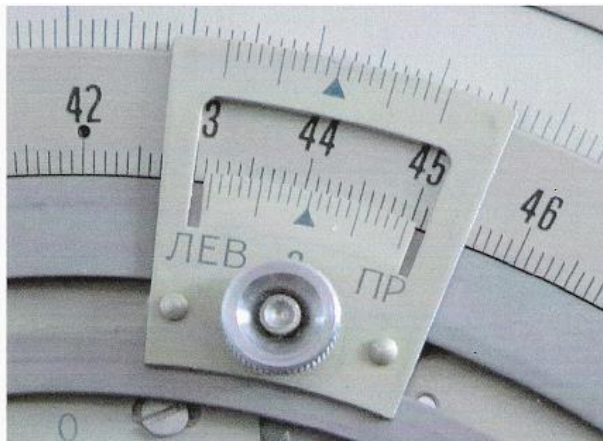


Figure 18 – Determination of lateral topographic variations

- position zero index noni right of zero index is a fixed scale of lateral deviation to the right, hundreds of parts are headed, read dozens of pieces by mark featuring one hundred parts to the right (each shorter pointer to determine is 10 dc), the individual components read by Noni (the lateral deviation right); each division Noni is 1 component, ie. a piece of noni to the right of zero index agrees with marking on a fixed scale, as many parts of the accused; similarly to lateral deviation to the left,
- position angle is determined by the formula
$$\varepsilon_C = \frac{h_C - h_B}{0,001 \cdot D_t^C} \cdot 0,95,$$

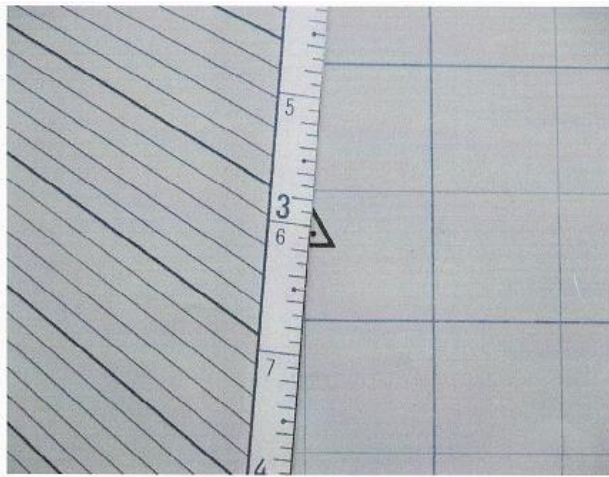


Figure 19 – Determination of viewing distance targets

- motion for extension shoe ruler to set the center hole in the housing target,
- ensure sledge locking screws,
- turn the ruler on the remote firing position,
- agree mark any sliding scale of zero index of upper tread Noni.

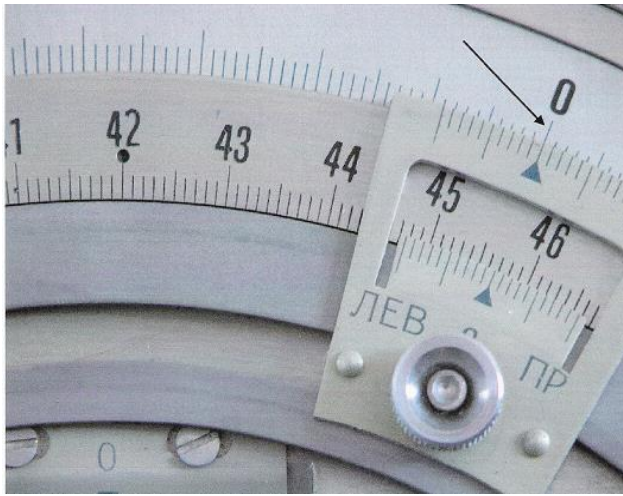


Figure 20 – Marking zero mark on a sliding scale

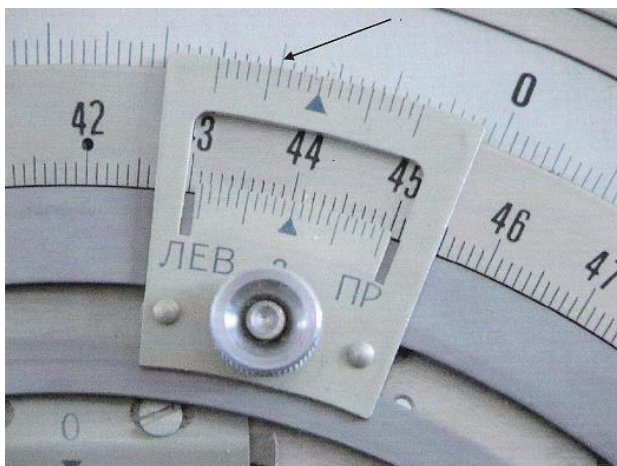


Figure 21 – Determination of the angle i

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- 4) MO ČR. *Doktrína Armády České republiky*. Praha: 2004. 148 s.
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