



AKADEMIA SZTABU GENERALNEGO
im. gen. broni K. Świerczewskiego

Egz. Nr 3

ppłk dypl. Włodzimierz KOSTRZEWSKI

MOŻLIWOŚCI I WAFUNKI WSPÓLDZIAŁANIA
MAŁOKALIBROWEJ ARTYLERII PRZECIWŁOTNICZEJ
Z LOTNICTWEM W SYSTEMIE OPL WOJSK

ROZPRAWA DOKTORSKA

(załączniki)



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25930

REMBERTÓW

LISTOPAD

1962



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1962

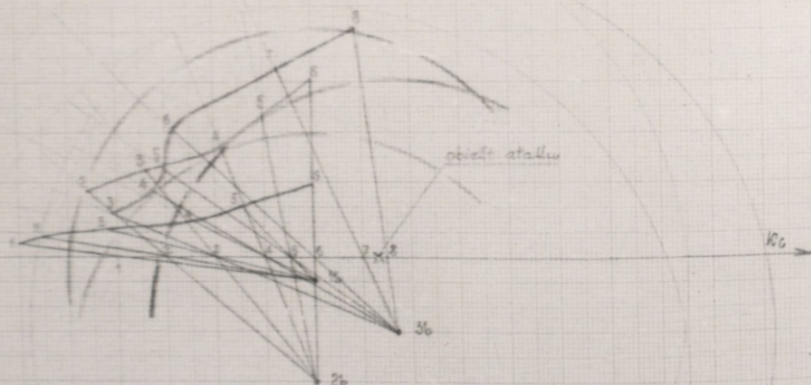
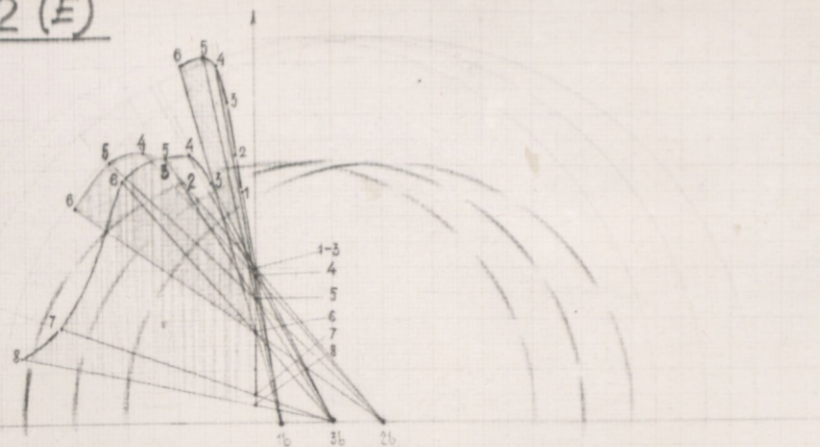
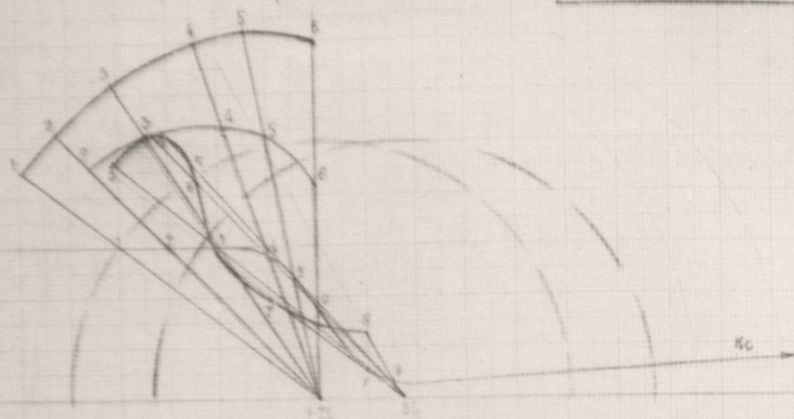
Adjective 54

Amelias post 12357 ∇

5120/500



WYKRES NR 2 (E)



Warunki wykonania: jak w zeszłym roku nr 1 (E)

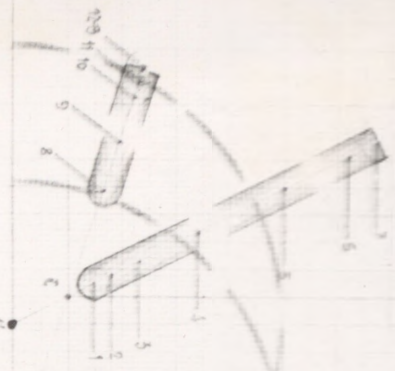
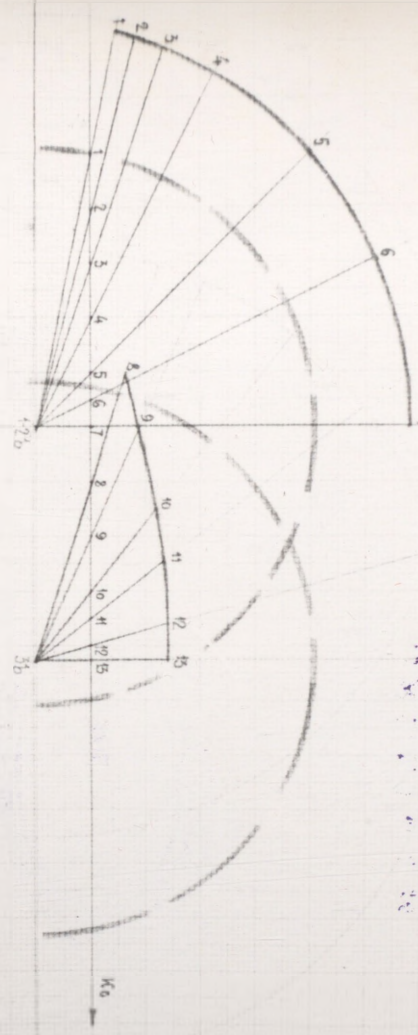
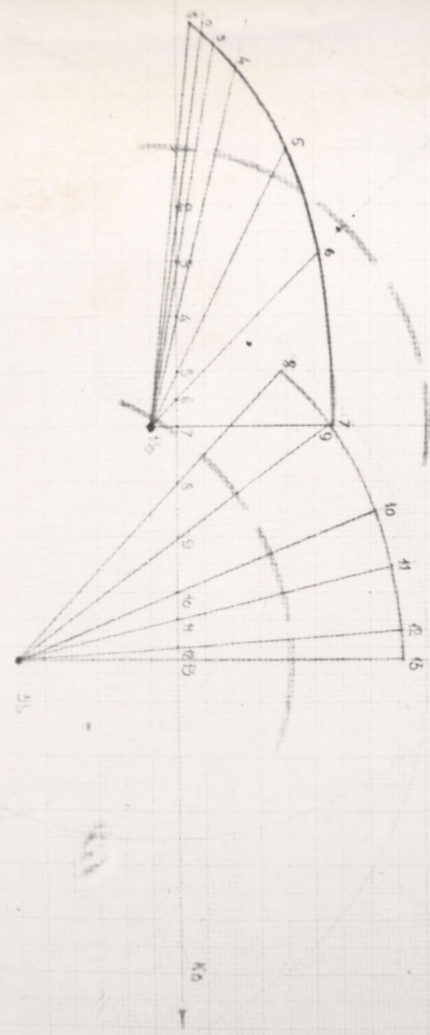
Wzrost: 1,70 m

Wzrost: 1,70 m

Wzrost: 1,70 m

Wzrost: 1,70 m

$V_c = 1000 \text{ m/s}$
 $\text{od } 1000 \text{ km} = 1000 \text{ m}$
 $V_c = 1000 \text{ m/s}$



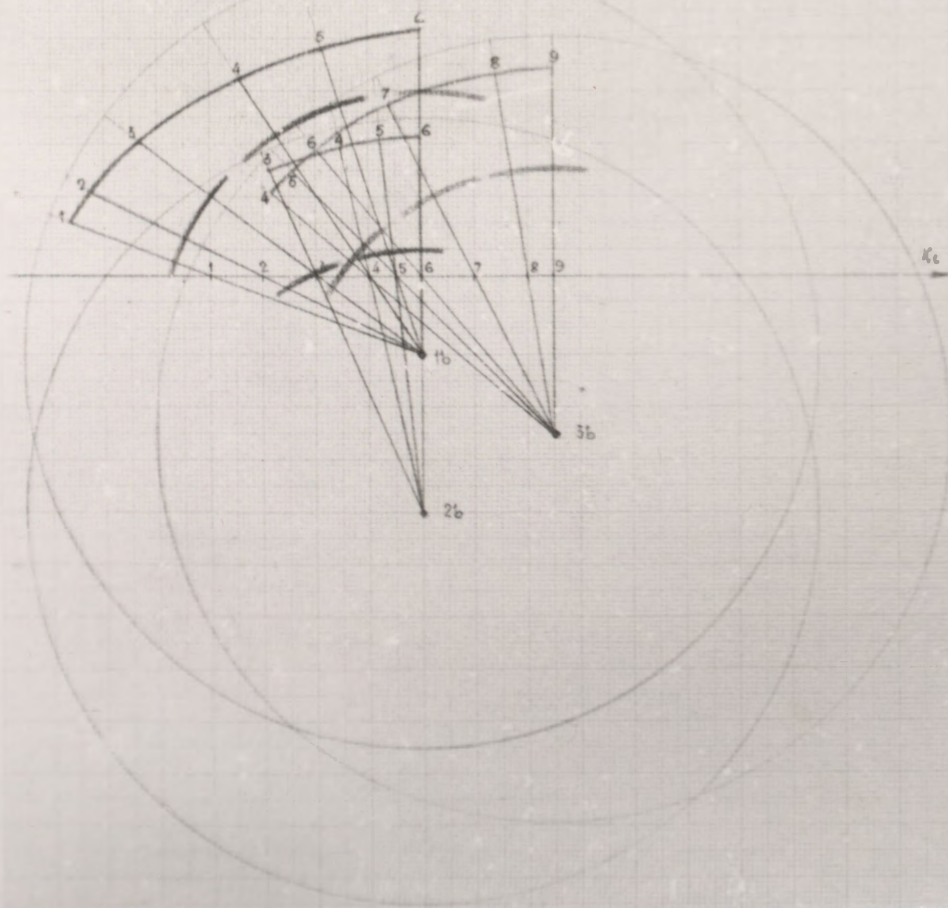
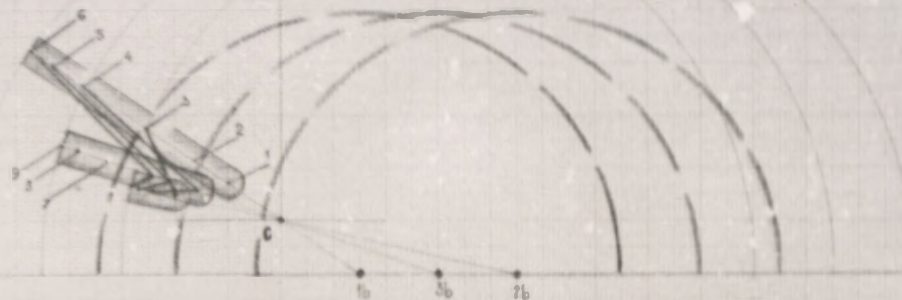
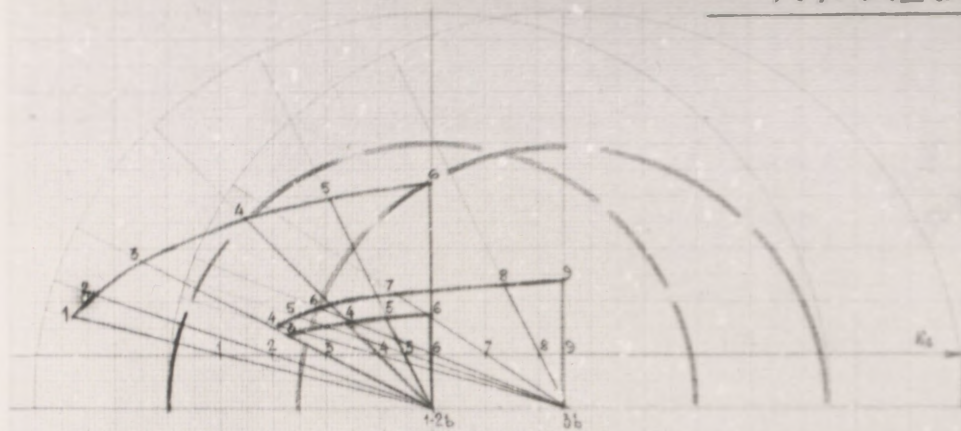
	l_1	l_2	l_3	l_4	l_5	l_6	l_7	l_8	l_9	l_{10}	l_{11}	l_{12}	l_{13}	P_{u+}
1	500	500	200	1100	2000	2600	2800	-	-	-	-	-	-	P_{u+k}
3	500	500	200	1100	2000	2600	2800	3200	3600	3900	4000	4100	-	P_{u+d}
5	500	500	200	1100	2000	2600	2800	3200	3600	3900	4000	4100	-	P_{u+u}
3	500	500	200	1100	2000	2600	2800	3200	3600	3900	4000	4100	-	P_{u+u}

$V_c = 333 \text{ m/s}$ (1200 km/h)
 Długość odcinka drogi: $l_{odc} = 9000 \text{ m}$
 Liniowa prędkość: $\approx 27 \text{ km/h}$
 1 lat: 15 sek
 3 lat: 9 sek

WYKRES NR 4 (D)

WYKRES NR 4(C)

$V_0 = 1000 \text{ m/s}$
 $\text{Średnica} = 1000 \text{ m}$
 $R = 500 \text{ m}$



Rad.	l_1	l_2	l_3	l_4	l_5	l_6	l_7	l_8	l_9	l_{10}	Suma
1	1000	1600	2100	2700	3300	3900	-	-	-	-	1000
2	-	-	2000	2400	2800	3200	-	-	-	-	1000
3	-	-	-	1600	2000	2400	2800	3200	3600	-	1000
4	2000	2400	2800	3200	3600	4000	-	-	-	-	1000
5	-	-	1600	2000	2400	2800	3200	3600	4000	-	1000
6	-	-	-	1600	2000	2400	2800	3200	3600	4000	1000
7	1000	1600	2100	2700	3300	3900	-	-	-	-	1000
8	-	-	2000	2400	2800	3200	3600	4000	4400	-	1000
9	-	-	-	1600	2000	2400	2800	3200	3600	4000	1000

$V_0 = 333 \text{ m/s}$ (Maksymalna)

Średnica okręgu drogi = 6000 m

Średnica okręgu sił = 18 m

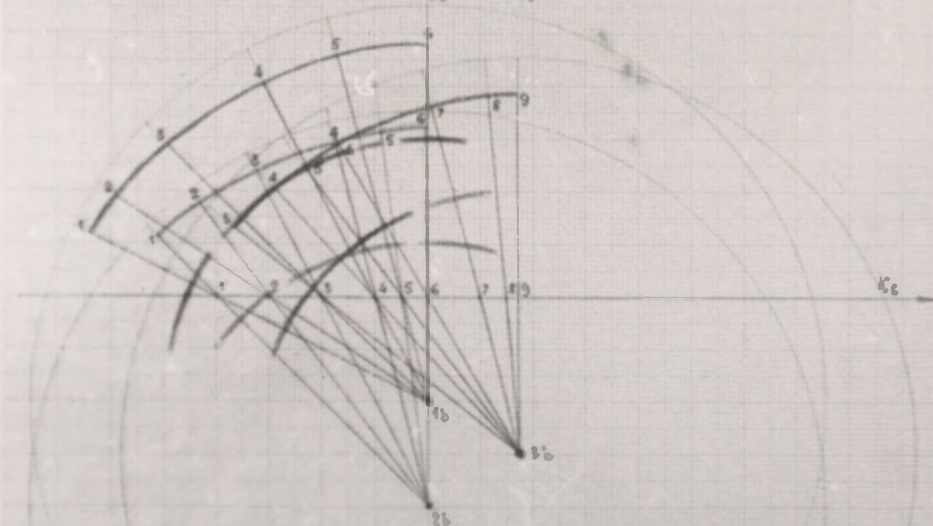
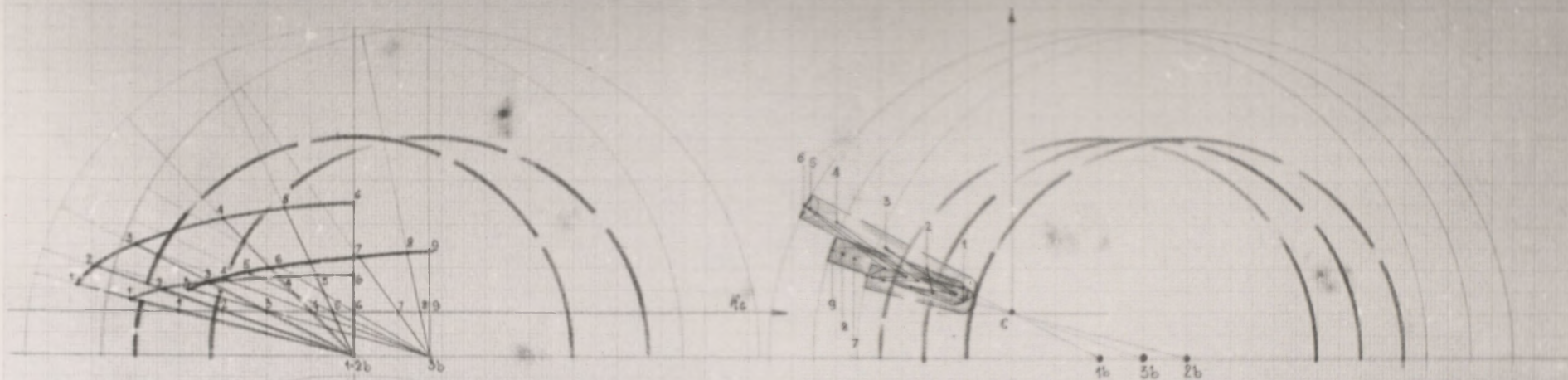
1. kół: 18 m

2. kół: 6 m

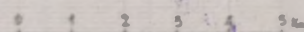
3. kół: 10 m

WYKRES NR 4 (3)

$\Delta t = 100 \text{ s}$
 develop heat = 2.4 m
 $R_e = \text{Reynold's number}$



Se no	g_{12}	l_1	l_2	l_3	l_4	l_5	l_6	l_7	l_8	l_9	+	Sum n, 10
1	1200	1200	500	4000	1600	1800	-	-	-	-		
2	1100	1800	2400	3000	3400	3200	-	-	-	-		Put 4
3	-	-	1300	2000	2500	2900	3600	1800	3200	-		
4	1400	3000	2000	2000	11000	-	-	-	-	-		
5	1100	1400	1300	700	400	-	-	-	-	-		Put 4
6	-	-	1800	2000	1300	1200	1000	300	-	-		
7	600	1000	1500	2100	2300	2400	-	-	-	-		
8	300	500	600	800	850	900	-	-	-	-		Put 4
9	-	-	500	700	900	1000	1200	1300	1450	-		

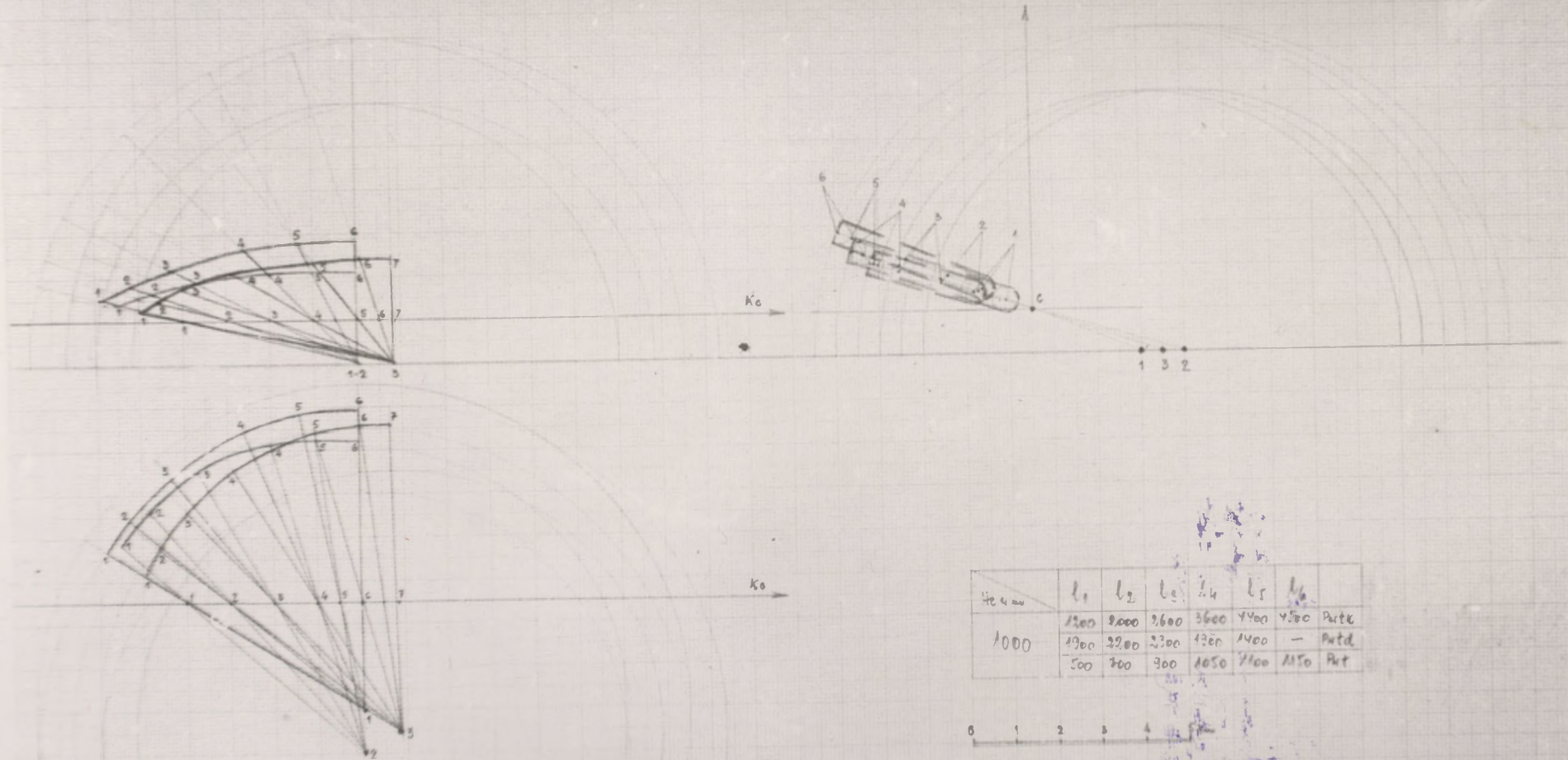

$$V_E = 333 \text{ m/s} \quad (1200 \text{ km/hr})$$

Abbildungskleinheit: 1 cm = 5 km

moderates standard = 18 cells

WYKRES NR 4(A)

Wskazówki:
Wskazówki: 1. Kąt
Kąt - 30° od kierunku wiatru



Wzrost	l_1	l_2	l_3	l_4	l_5	l_6	
1000	1200	8000	2600	3600	4400	4500	Punkt
	1200	2200	2300	1300	1400	-	Punkt
	500	200	300	1050	1100	1150	Punkt

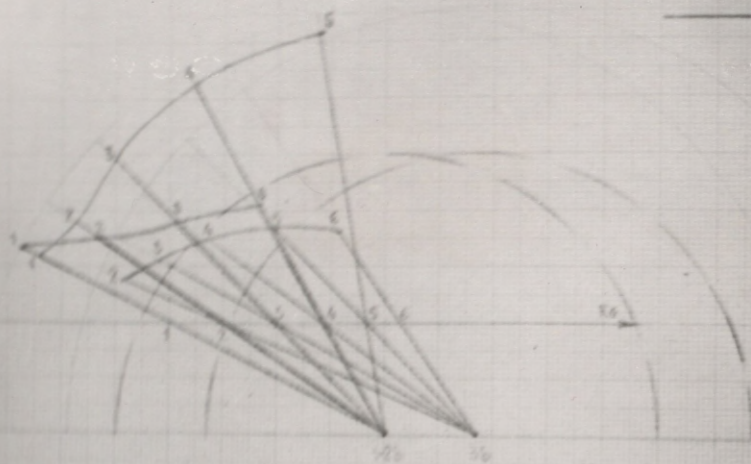
0 1 2 3 4

$$V_k = 933 \text{ m/sk} (1200 \text{ km/h})$$

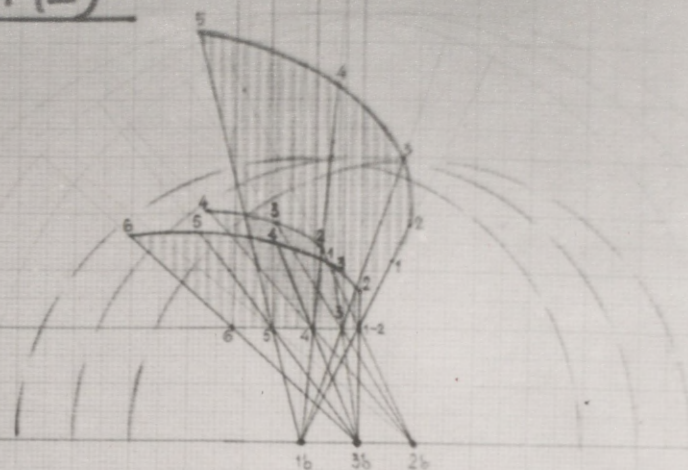
Przedstawienie położenia drogi lotu w skali $\approx 5000 \text{ m}$

Średnia czas przelotu $\approx 15 \text{ sek}$ (do punktu 2)

WYKRES NR 4 (E)



K0



Złożenie wektora składowego małego prędkości samolotu względem kierunku
(poważnie - błąd)

$$R = \frac{V_0^2}{g \sin \beta}$$

Jane:

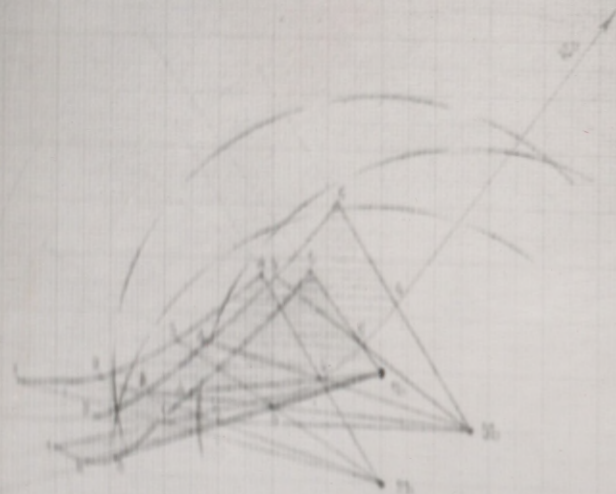
$$V_0 = 300 \text{ m/s}$$

$$g = 10 \text{ m/s}^2$$

$$\beta_{\max} = 60^\circ$$

$$\sin \beta = 1.73$$

$$R = \frac{(300 \frac{\text{m}}{\text{s}})^2}{10 \frac{\text{m}}{\text{s}^2} \cdot 1.73} = \frac{90000 \frac{\text{m}^2}{\text{s}^2}}{17.3 \frac{\text{m}}{\text{s}^2}} = 5203 \text{ m}$$



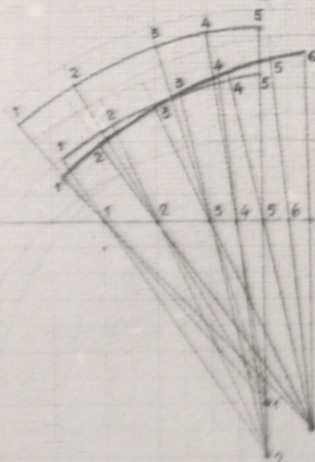
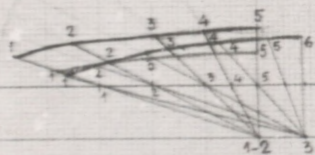
WYKRES NR 5(A)

Wykres nr 5 (A)

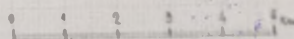
$H_0 = 1000 \text{ m}$

odległość $L_0 = 10 \text{ km}$

$K_0 = 10 \text{ km}$ od środka okręgu



$D_{\text{człowiek}}$	L_1	L_2	L_3	L_4	L_5	
	1900	2650	3350	3600	5700	$P_{\text{czł}}$
1000	1600	1600	1100	1000		$P_{\text{czł}}$
	500	700	900	1000	1100	$P_{\text{czł}}$



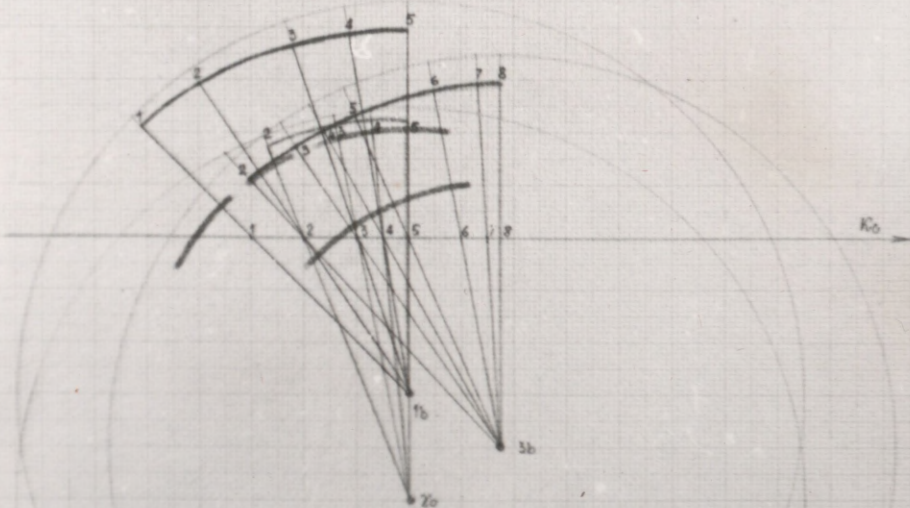
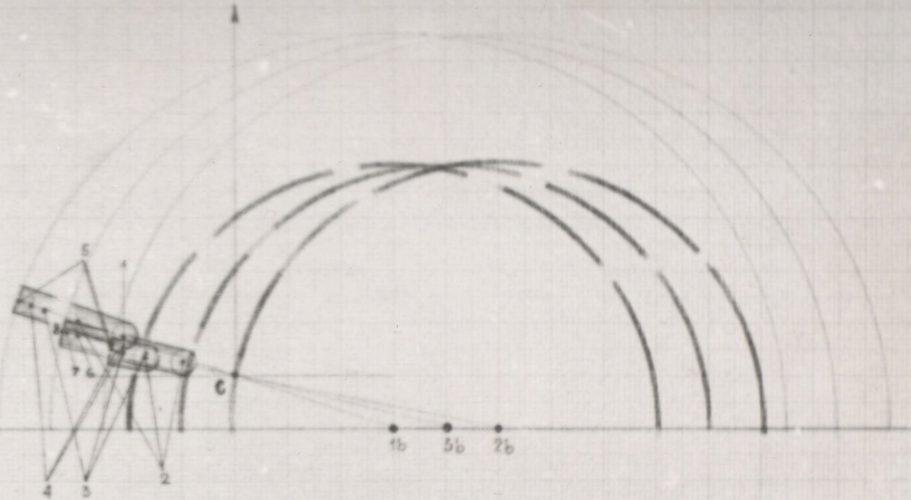
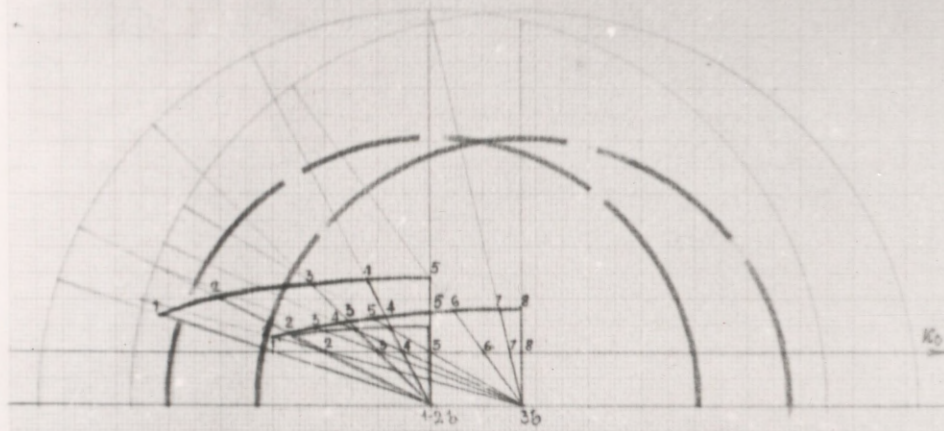
$V_0 = 333 \text{ m/s}$ (1000 km/h)

Odległość od środka okręgu $H_0 = 1000 \text{ m}$

Średni czas studiów 10 min

WYKRES NR 5(B)

WYKRES NR 5 (B)
 Dł. = 1000m
 podstop. bel. = 20m
 K₀ = 20m od środka w.



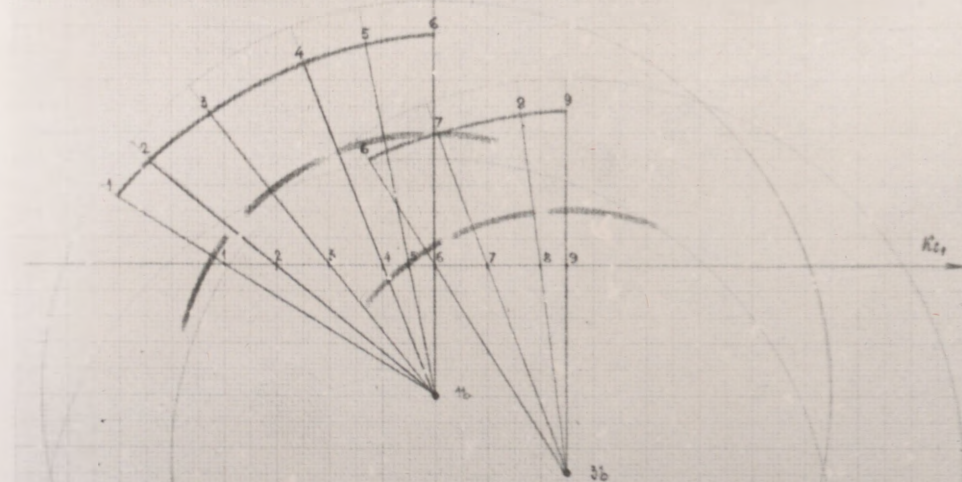
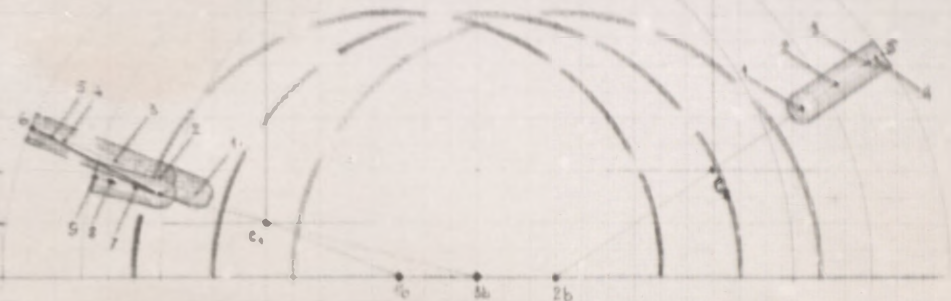
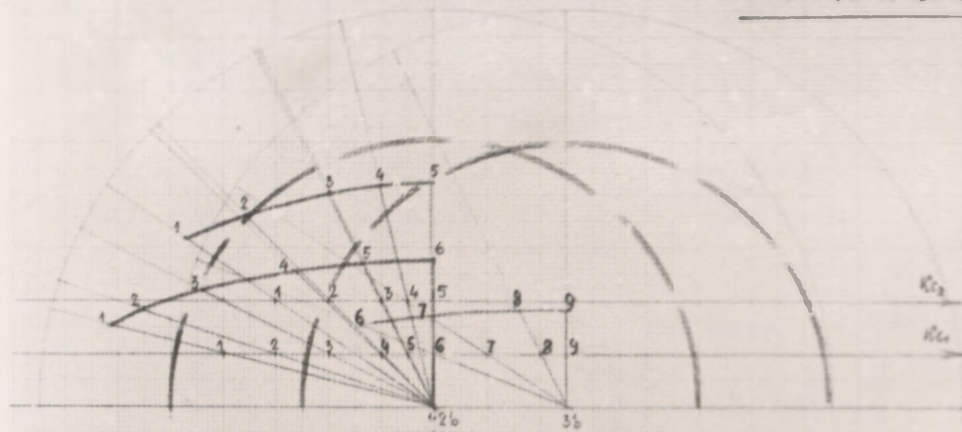
	l_0	l_1	l_2	l_3	l_4	l_5	l_6	l_7	l_8	Suma a. inn.
1000	1000	2900	3600	3900	4000	-	-	-	-	
2	-	2700	3100	2200	3300	-	-	-	-	P. t. k.
3	-	1100	1700	2000	2800	2800	2700	2000	-	
4	2500	2000	1300	200	-	-	-	-	-	
5	-	600	400	500	-	-	-	-	-	P. t. d.
6	-	1500	1200	1200	1100	600	200	-	-	
7	700	1000	1200	1300	1400	-	-	-	-	
8	-	350	400	450	500	-	-	-	-	P. t. k.
9	-	300	500	550	600	800	800	800	1100	

$$V_c = 333 \text{ m/s} (1200 \text{ km/h})$$

Ostrzałowy odrzut drogi od $\approx 5000 \text{ m}$

Ładunek mas strzałowy $\approx 15 \text{ t}$

WYKRES NR 5 (C)



z = m	z	l ₁	l ₂	l ₃	l ₄	l ₅	l ₆	l ₇	l ₈	l ₉	l ₁₀	Suma l _i w. l ₁₀
1000	1	2500	1900	2900	3800	1200	1400	2000	2500	2900	3500	-
	2	2200	2500	2400	1600	1800	2000	2500	2900	3500	3800	-
	3	2000	2500	2400	1600	1800	2000	2500	2900	3500	3800	-
	4	2000	2500	2400	1600	1800	2000	2500	2900	3500	3800	-
	5	2000	2500	2400	1600	1800	2000	2500	2900	3500	3800	-
2000	2	1600	2500	3000	3100	3200	3300	3400	3500	3600	3700	-
	3	1500	2500	3000	3100	3200	3300	3400	3500	3600	3700	-
	4	1400	2500	3000	3100	3200	3300	3400	3500	3600	3700	-

$V_{c,12} = 323 \text{ m/s}$ (Maks. 800)

Obliczenia: $z = 1000 \text{ m}$

nr 2 = 3000 m

Indeks: $z = 1000 \text{ m}$

nr 2 = 9 m

1. $z = 12 \text{ m}$

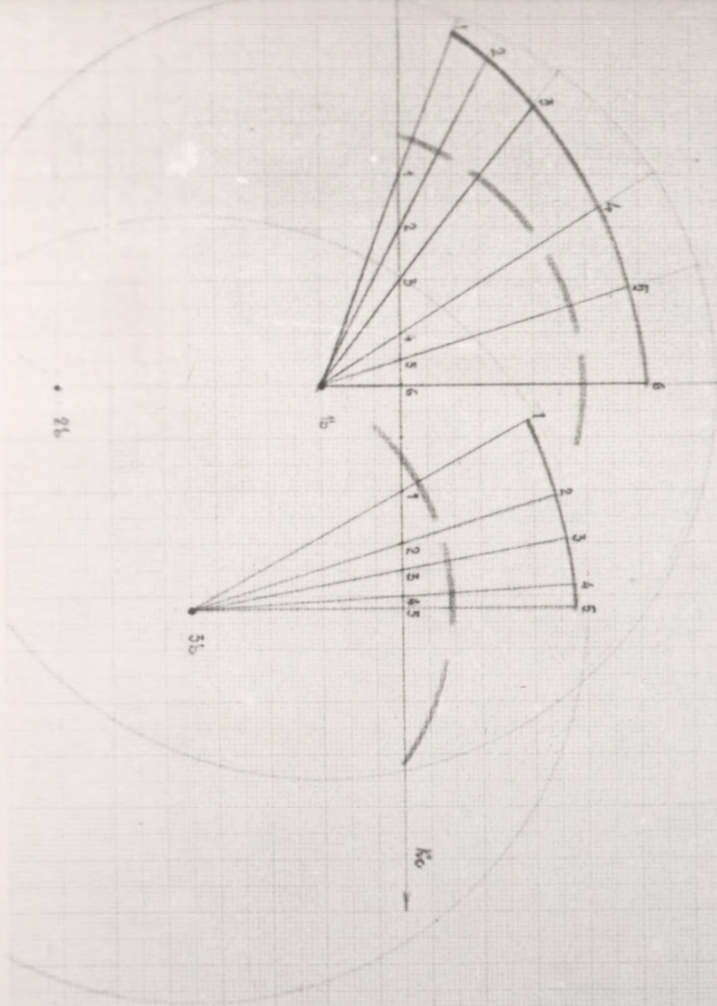
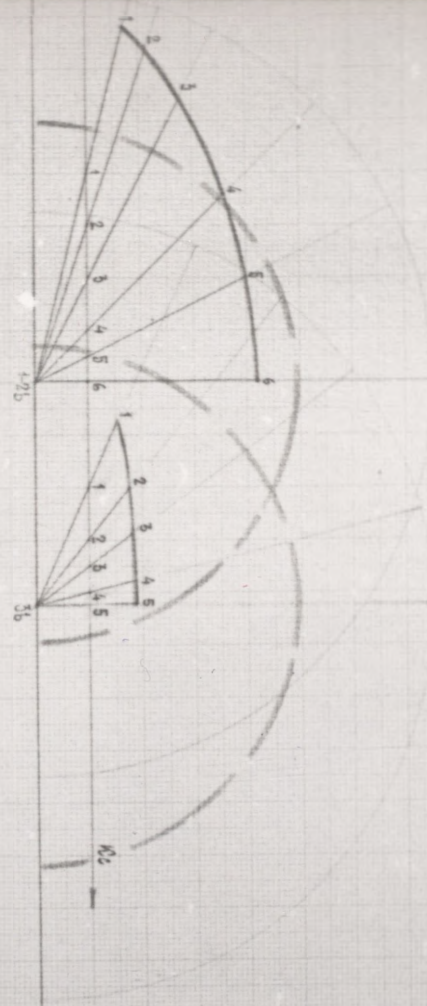
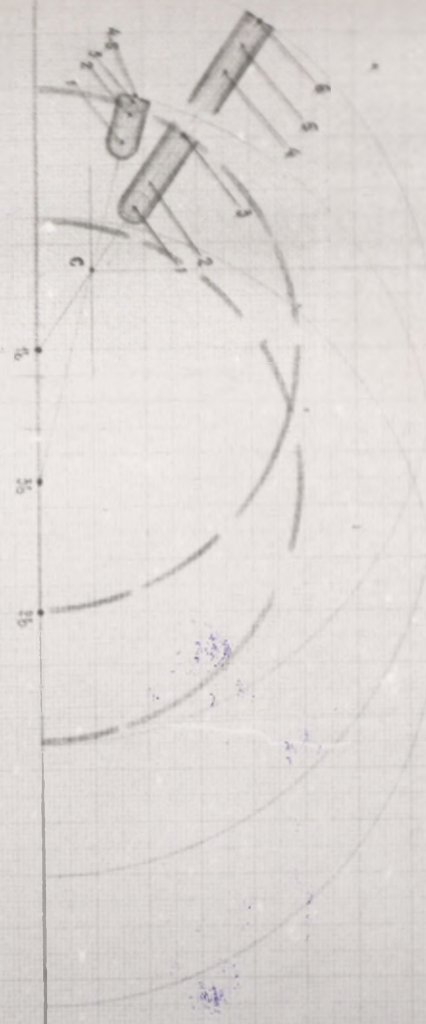
2. $z = 8 \text{ m}$

3. $z = 9 \text{ m}$

$V_{c,12} = 323 \text{ m/s}$
 $V_{c,12} = 323 \text{ m/s}$
 $V_{c,12} = 323 \text{ m/s}$
 $V_{c,12} = 323 \text{ m/s}$
 $V_{c,12} = 323 \text{ m/s}$

$h_0 = 1000 \text{ m}$
 $\text{skokowy krok} = 5 \text{ m}$
 $R_0 = 1000 \text{ m}$ (średnica okręgu)

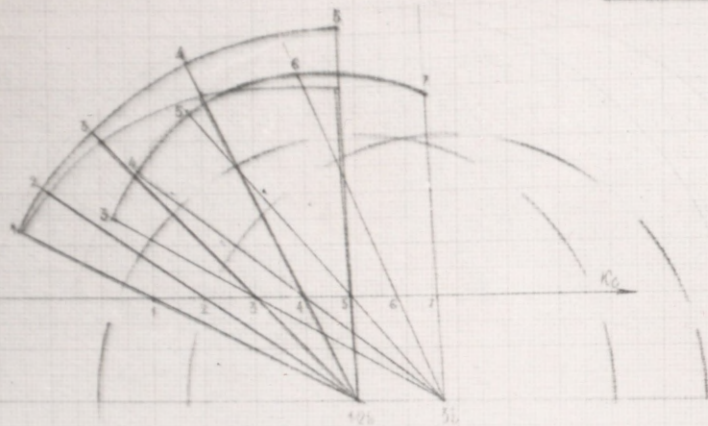
WYKRES NR 5 (D)



h_0 w m	$B_{0,1}$	l_1	l_2	l_3	l_4	l_5	l_6	Pat
1000	1	2000	1700	2500	3700	4300	4500	PatK
	3	2400	2900	3100	3300	3300	-	PatK
	1	2800	3400	3400	2500	1500	-	PatL
	3	1300	1000	600	200	-	-	PatL
	1	700	1100	1800	2600	3900	3200	PatH
	3	600	800	800	900	900	-	PatH

$V_c = 333 \text{ m/sok (1200 km/god.)}$
 Okrężność okręgu drogi ok. $\approx 6000 \text{ m}$
 Średni czas skoku $\approx 18 \text{ sok}$
 $1 \text{ krok} \approx 12 \text{ sok}$
 $3 \text{ kroki} \approx 6 \text{ sok.}$

WYKRES NR 5 (E)



R0

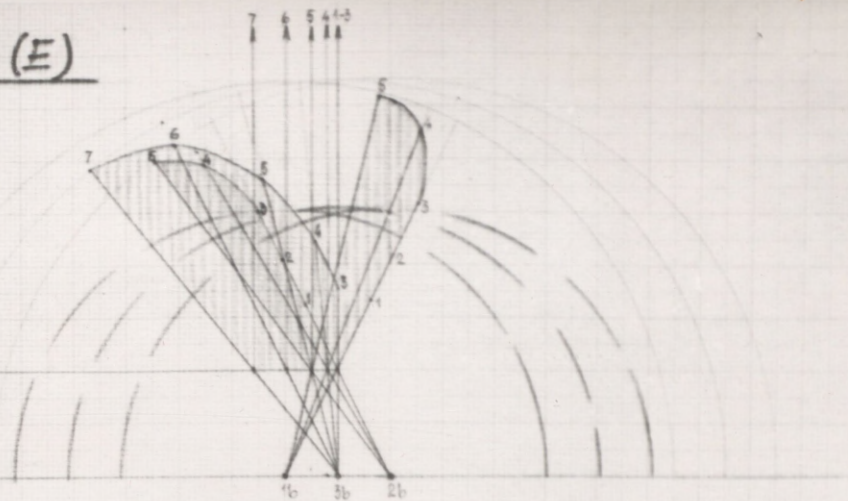


Diagram nr 5 (E)

Wykres nr 5 (E)

Geometria

Wykres nr 5 (E)

R = 2000 m

Wzrost człowieka: 1,75 m

$$R = \frac{V_c^2}{g \cdot \gamma \cdot \beta}$$

Dane:

$$V_c = 420 \text{ m/s}$$

$$g = 10 \text{ m/s}^2$$

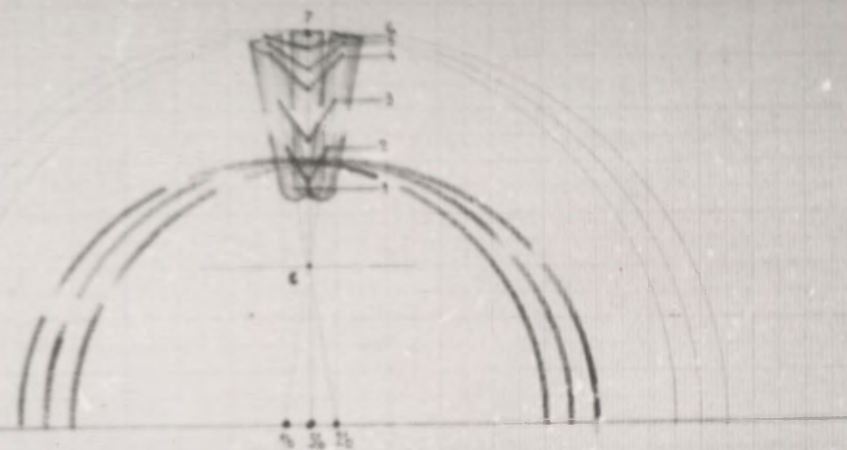
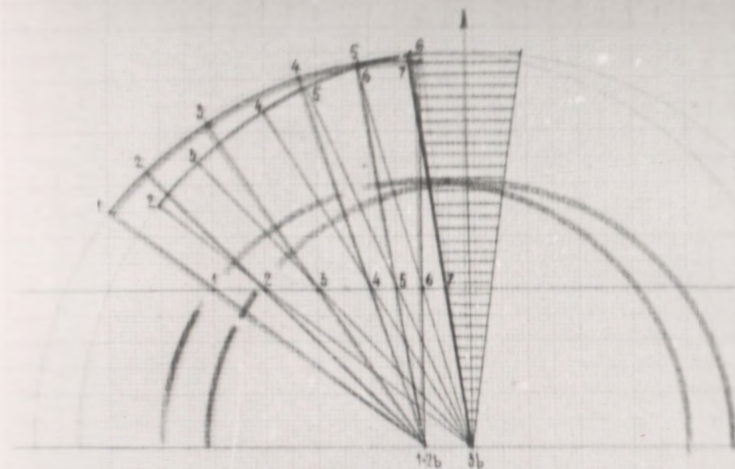
$$\beta_{\max} = 70^\circ$$

$$\gamma \cdot \beta = 2,75$$

$$R = \frac{(420 \text{ m/s})^2}{10 \text{ m/s}^2 \cdot 2,75} = \frac{176400 \text{ m}}{27,5} = 6414,5 \text{ m}$$

WYKRES NR 6(A)

$R_0 = 3300m$
 $R_{0b} = 3300m$
 $R_0 = 3300m$



	l_1	l_2	l_3	l_4	l_5	l_6	l_7	R_{0b}
1	300	400	600	700	800	1000	-	R_{0b}
2	300	400	600	700	800	1000	-	R_{0b}
3	-	-	-	-	-	-	-	R_{0b}
4	1000	1200	1400	1600	1800	2000	-	R_{0b}
5	1000	1200	1400	1600	1800	2000	-	R_{0b}
6	-	1000	1200	1400	1600	1800	2000	R_{0b}
7	1000	1200	1400	1600	1800	2000	-	R_{0b}
8	-	1000	1200	1400	1600	1800	2000	R_{0b}

$R_0 = 333m/sec$ (1200 km/h)

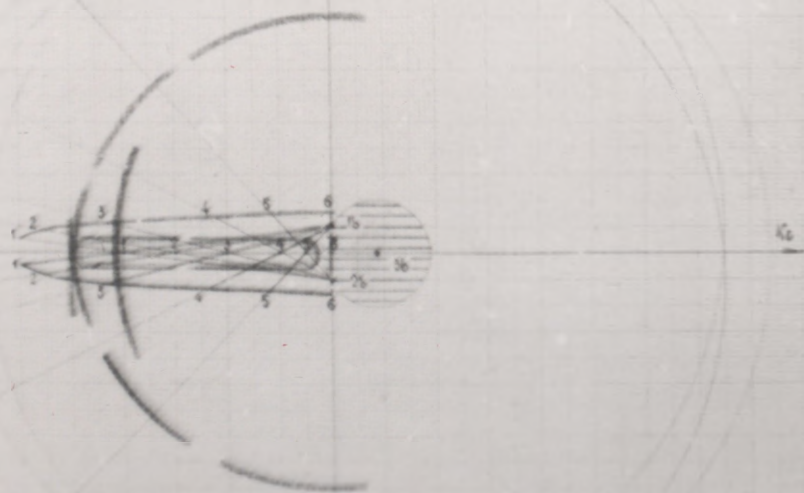
Wzrostowy obrotowy drogi roku $\approx 4000m$

Indeks czas struktury $\approx 12m$

1. $h_{0b} \approx 12m$

2. $h_{0b} \approx 12m$

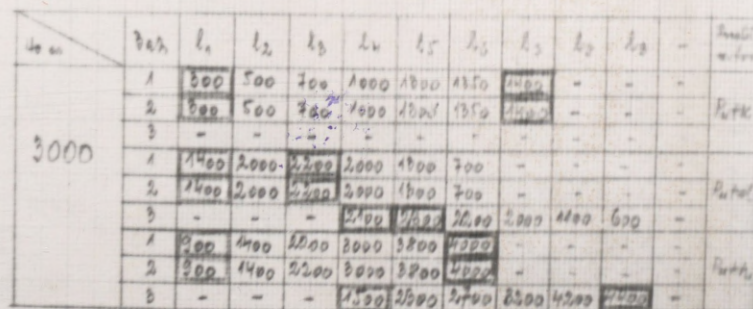
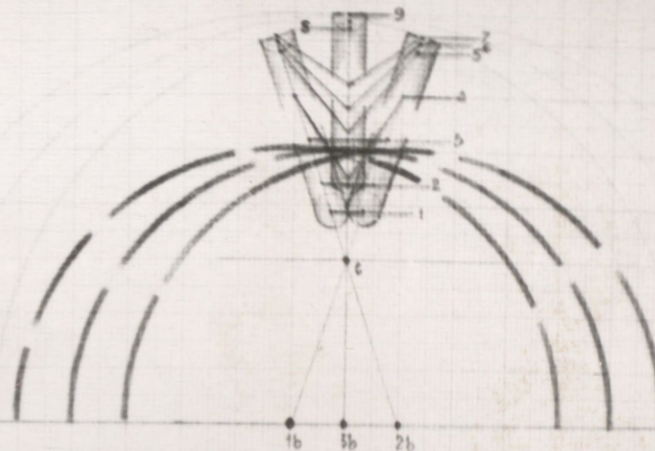
3. $h_{0b} \approx 10m$



James M. Smith

Volleyball = 240

$K_E = 1000000$ ang

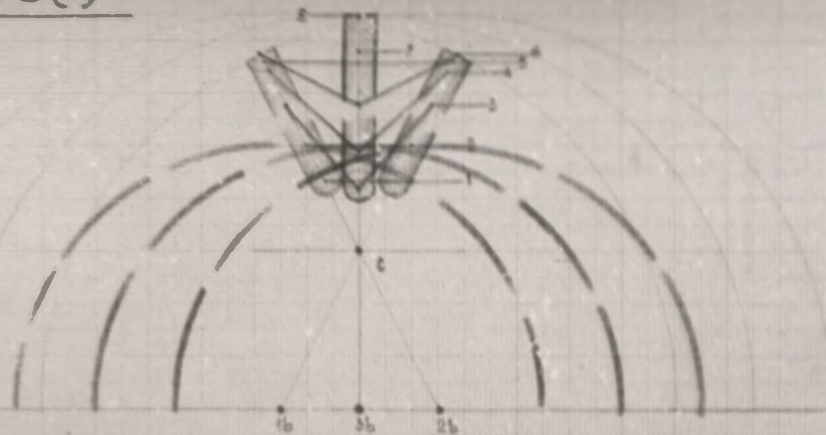
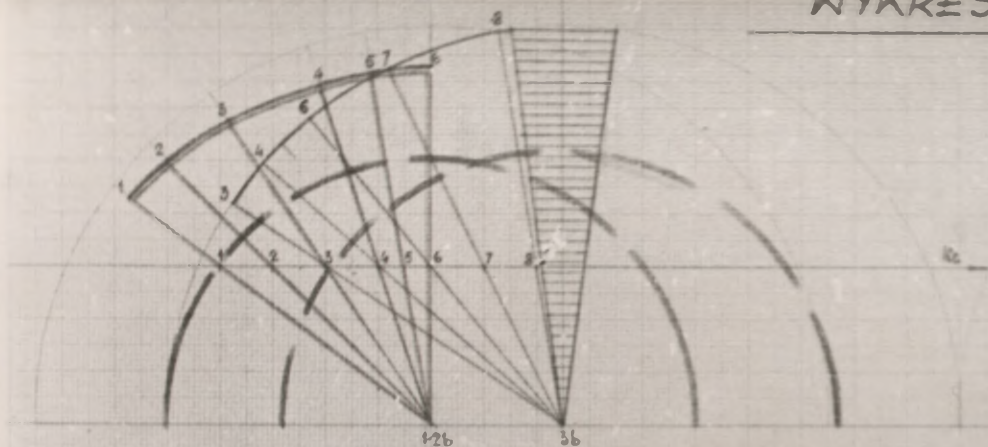


Distensi yang diakibatkan dari suhu $\approx 6000\text{ms}$

Enslin aus Kuelmb. 5 18 Sek.

WYKRES NR 6(C)

Sc - Srodek
 1st - 1st
 2nd - 2nd
 3rd - 3rd



Sc	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th	16th	17th	18th	19th	20th	21st	22nd	23rd	24th	25th	26th	27th	28th	29th	30th	31st	32nd	33rd	34th	35th	36th	37th	38th	39th	40th	41st	42nd	43rd	44th	45th	46th	47th	48th	49th	50th	51st	52nd	53rd	54th	55th	56th	57th	58th	59th	60th	61st	62nd	63rd	64th	65th	66th	67th	68th	69th	70th	71st	72nd	73rd	74th	75th	76th	77th	78th	79th	80th	81st	82nd	83rd	84th	85th	86th	87th	88th	89th	90th	91st	92nd	93rd	94th	95th	96th	97th	98th	99th	100th	101st	102nd	103rd	104th	105th	106th	107th	108th	109th	110th	111st	112nd	113rd	114th	115th	116th	117th	118th	119th	120th	121st	122nd	123rd	124th	125th	126th	127th	128th	129th	130th	131st	132nd	133rd	134th	135th	136th	137th	138th	139th	140th	141st	142nd	143rd	144th	145th	146th	147th	148th	149th	150th	151st	152nd	153rd	154th	155th	156th	157th	158th	159th	160th	161st	162nd	163rd	164th	165th	166th	167th	168th	169th	170th	171st	172nd	173rd	174th	175th	176th	177th	178th	179th	180th	181st	182nd	183rd	184th	185th	186th	187th	188th	189th	190th	191st	192nd	193rd	194th	195th	196th	197th	198th	199th	200th	201st	202nd	203rd	204th	205th	206th	207th	208th	209th	210th	211st	212nd	213rd	214th	215th	216th	217th	218th	219th	220th	221st	222nd	223rd	224th	225th	226th	227th	228th	229th	230th	231st	232nd	233rd	234th	235th	236th	237th	238th	239th	240th	241st	242nd	243rd	244th	245th	246th	247th	248th	249th	250th	251st	252nd	253rd	254th	255th	256th	257th	258th	259th	260th	261st	262nd	263rd	264th	265th	266th	267th	268th	269th	270th	271st	272nd	273rd	274th	275th	276th	277th	278th	279th	280th	281st	282nd	283rd	284th	285th	286th	287th	288th	289th	290th	291st	292nd	293rd	294th	295th	296th	297th	298th	299th	300th	301st	302nd	303rd	304th	305th	306th	307th	308th	309th	310th	311st	312nd	313rd	314th	315th	316th	317th	318th	319th	320th	321st	322nd	323rd	324th	325th	326th	327th	328th	329th	330th	331st	332nd	333rd	334th	335th	336th	337th	338th	339th	340th	341st	342nd	343rd	344th	345th	346th	347th	348th	349th	350th	351st	352nd	353rd	354th	355th	356th	357th	358th	359th	360th	361st	362nd	363rd	364th	365th	366th	367th	368th	369th	370th	371st	372nd	373rd	374th	375th	376th	377th	378th	379th	380th	381st	382nd	383rd	384th	385th	386th	387th	388th	389th	390th	391st	392nd	393rd	394th	395th	396th	397th	398th	399th	400th	401st	402nd	403rd	404th	405th	406th	407th	408th	409th	410th	411st	412nd	413rd	414th	415th	416th	417th	418th	419th	420th	421st	422nd	423rd	424th	425th	426th	427th	428th	429th	430th	431st	432nd	433rd	434th	435th	436th	437th	438th	439th	440th	441st	442nd	443rd	444th	445th	446th	447th	448th	449th	450th	451st	452nd	453rd	454th	455th	456th	457th	458th	459th	460th	461st	462nd	463rd	464th	465th	466th	467th	468th	469th	470th	471st	472nd	473rd	474th	475th	476th	477th	478th	479th	480th	481st	482nd	483rd	484th	485th	486th	487th	488th	489th	490th	491st	492nd	493rd	494th	495th	496th	497th	498th	499th	500th	501st	502nd	503rd	504th	505th	506th	507th	508th	509th	510th	511st	512nd	513rd	514th	515th	516th	517th	518th	519th	520th	521st	522nd	523rd	524th	525th	526th	527th	528th	529th	530th	531st	532nd	533rd	534th	535th	536th	537th	538th	539th	540th	541st	542nd	543rd	544th	545th	546th	547th	548th	549th	550th	551st	552nd	553rd	554th	555th	556th	557th	558th	559th	560th	561st	562nd	563rd	564th	565th	566th	567th	568th	569th	570th	571st	572nd	573rd	574th	575th	576th	577th	578th	579th	580th	581st	582nd	583rd	584th	585th	586th	587th	588th	589th	590th	591st	592nd	593rd	594th	595th	596th	597th	598th	599th	600th	601st	602nd	603rd	604th	605th	606th	607th	608th	609th	610th	611st	612nd	613rd	614th	615th	616th	617th	618th	619th	620th	621st	622nd	623rd	624th	625th	626th	627th	628th	629th	630th	631st	632nd	633rd	634th	635th	636th	637th	638th	639th	640th	641st	642nd	643rd	644th	645th	646th	647th	648th	649th	650th	651st	652nd	653rd	654th	655th	656th	657th	658th	659th	660th	661st	662nd	663rd	664th	665th	666th	667th	668th	669th	670th	671st	672nd	673rd	674th	675th	676th	677th	678th	679th	680th	681st	682nd	683rd	684th	685th	686th	687th	688th	689th	690th	691st	692nd	693rd	694th	695th	696th	697th	698th	699th	700th	701st	702nd	703rd	704th	705th	706th	707th	708th	709th	710th	711st	712nd	713rd	714th	715th	716th	717th	718th	719th	720th	721st	722nd	723rd	724th	725th	726th	727th	728th	729th	730th	731st	732nd	733rd	734th	735th	736th	737th	738th	739th	740th	741st	742nd	743rd	744th	745th	746th	747th	748th	749th	750th	751st	752nd	753rd	754th	755th	756th	757th	758th	759th	760th	761st	762nd	763rd	764th	765th	766th	767th	768th	769th	770th	771st	772nd	773rd	774th	775th	776th	777th	778th	779th	780th	781st	782nd	783rd	784th	785th	786th	787th	788th	789th	790th	791st	792nd	793rd	794th	795th	796th	797th	798th	799th	800th	801st	802nd	803rd	804th	805th	806th	807th	808th	809th	810th	811st	812nd	813rd	814th	815th	816th	817th	818th	819th	820th	821st	822nd	823rd	824th	825th	826th	827th	828th	829th	830th	831st	832nd	833rd	834th	835th	836th	837th	838th	839th	840th	841st	842nd	843rd	844th	845th	846th	847th	848th	849th	850th	851st	852nd	853rd	854th	855th	856th	857th	858th	859th	860th	861st	862nd	863rd	864th	865th	866th	867th	868th	869th	870th	871st	872nd	873rd	874th	875th	876th	877th	878th	879th	880th	881st	882nd	883rd	884th	885th	886th	887th	888th	889th	890th	891st	892nd	893rd	894th	895th	896th	897th	898th	899th	900th	901st	902nd	903rd	904th	905th	906th	907th	908th	909th	910th	911st	912nd	913rd	914th	915th	916th	917th	918th	919th	920th	921st	922nd	923rd	924th	925th	926th	927th	928th	929th	930th	931st	932nd	933rd	934th	935th	936th	937th	938th	939th	940th	941st	942nd	943rd	944th	945th	946th	947th	948th	949th	950th	951st	952nd	953rd	954th	955th	956th	957th	958th	959th	960th	961st	962nd	963rd	964th	965th	966th	967th	968th	969th	970th	971st	972nd	973rd	974th	975th	976th	977th	978th	979th	980th	981st	982nd	983rd	984th	985th	986th	987th	988th	989th	990th	991st	992nd	993rd	994th	995th	996th	997th	998th	999th	1000th
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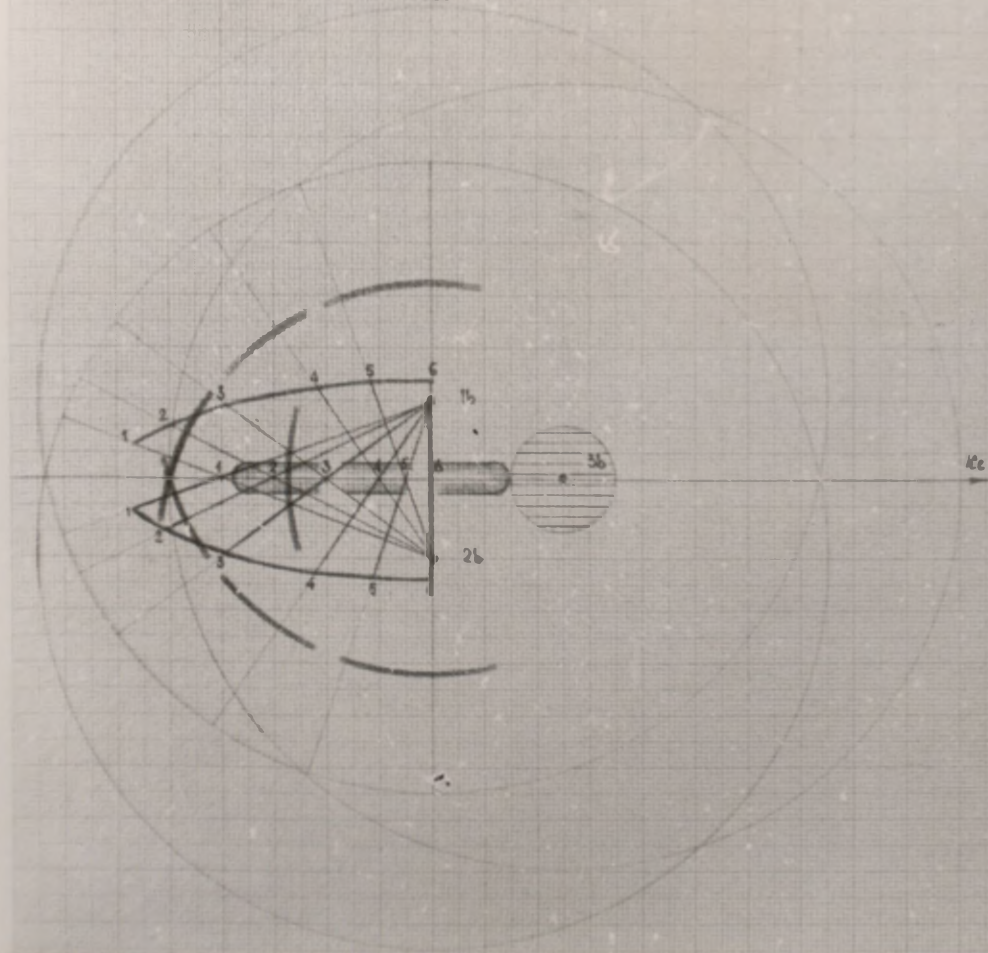
$V_c = 333 \text{ m/s}$ (1200 km/h)

Distancja od punktu startu do punktu docelowego $\approx 6000 \text{ m}$

Ładunek $\approx 18 \text{ t}$

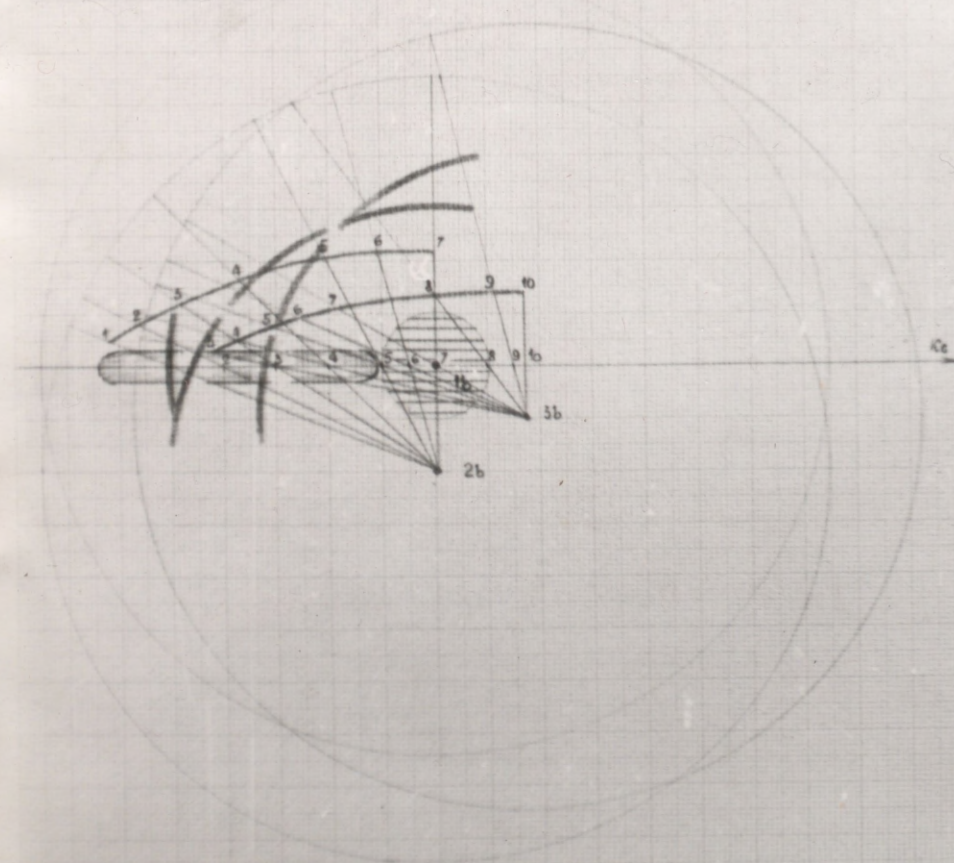
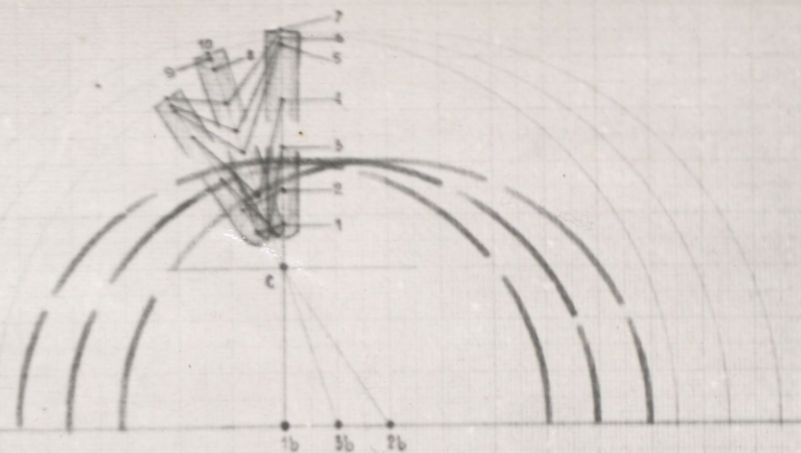
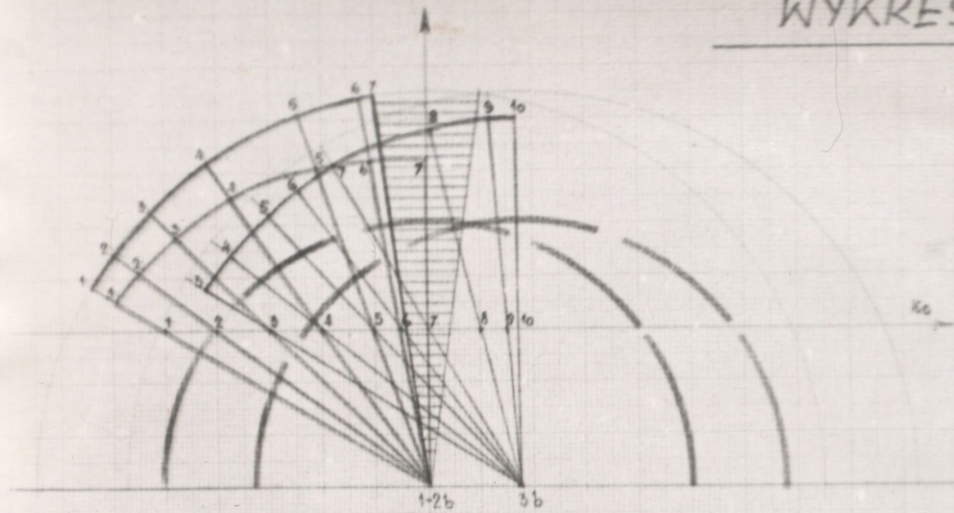
1.2 t $\approx 12 \text{ t}$

3 t $\approx 12 \text{ t}$



WYKRES NR 7(B)

$V_0 = 3000 \text{ m/s}$
 $\text{odstęp } l_{10} = 2000$
 $K_0 = 1000 \text{ od } 100000 \text{ m/s}$



$l_{10} \text{ m}$	l_1	l_2	l_3	l_4	l_5	l_6	l_7	l_8	l_9	l_{10}	Przebieg
3000	-	-	-	-	-	-	-	-	-	-	-
1	500	800	1200	1700	2200	2800	3500	-	-	-	Pu10
2	-	-	1000	1500	2000	2600	3300	4000	4800	-	-
3	1000	1500	2100	2800	3500	4300	5200	-	-	-	Pu10
4	-	-	1200	1800	2500	3300	4200	5200	-	-	-
5	1500	2200	3000	3900	4900	6000	7200	8500	-	-	Pu10
6	-	-	1400	2100	2900	3800	4800	5900	7100	-	-
7	2000	2800	3700	4700	5800	7000	8300	9700	11200	-	-
8	-	-	1600	2400	3300	4300	5400	6600	7900	-	-
9	2500	3400	4400	5500	6700	8000	9400	10900	12500	-	-
10	-	-	1800	2700	3700	4800	6000	7300	8700	-	-

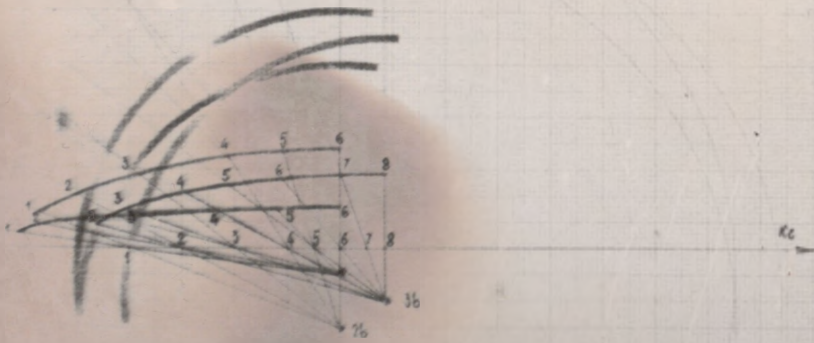
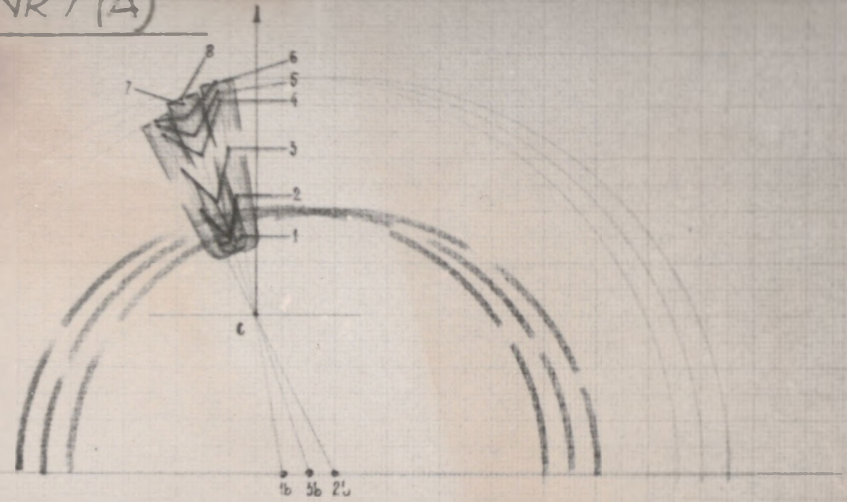
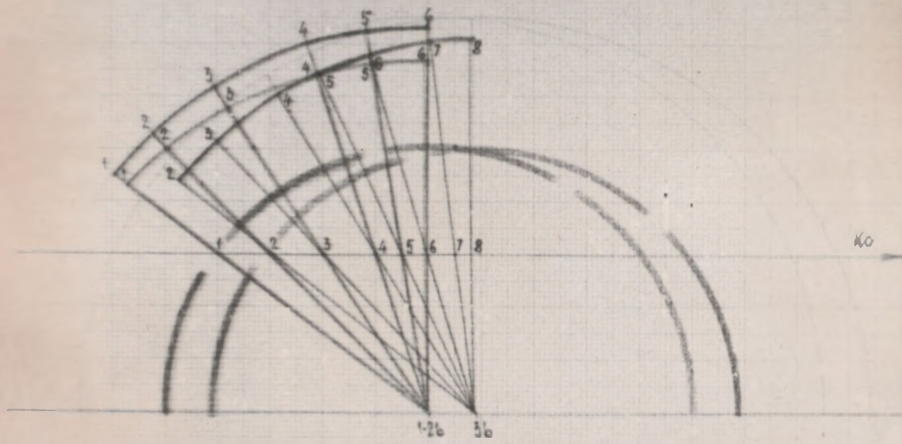
$$V_0 = 333 \text{ m/sk (1000m/3s)}$$

Wskazywany odstęp drogi celu $\approx 7000 \text{ m}$

Prędkość mas $\approx 9 \text{ m/sk}$

WYKRES NR 7 (A)

$l_0 = 3000 \text{ m}$
 $l_{\text{skł}} = l_0 \cdot \sin \alpha$
 $l_{\text{h}} = l_0 \cdot \cos \alpha$



Sezon	3 lat	l_1	l_2	l_3	l_4	l_5	l_6	l_7	l_8	Pyt
3000	1	200	400	600	210	800	800	-	-	P4t
	2	200	1000	1400	1700	1900	1900	-	-	
	3	-	400	600	1000	1200	1800	1900	1900	
	4	1400	2300	2100	1300	200	-	-	-	P4t
	5	1700	2000	1800	1100	600	-	-	-	
	6	-	1800	2000	1800	1600	1100	500	-	
	7	1500	2300	3200	1000	4200	9400	-	-	4.46
	8	1300	2000	2700	3400	3600	3500	-	-	
	9	-	1400	2200	2400	3400	3800	4000	4000	

$$V_e = 333 \text{ m/s} \quad (1100 \text{ km/h})$$

Ostrulowany odcinek drogi $l_{\text{odr}} = 5000 \text{ m}$

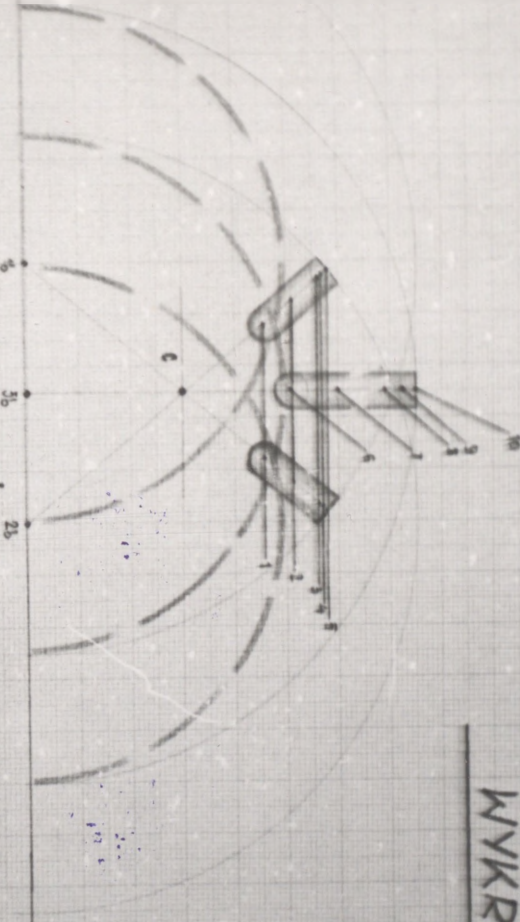
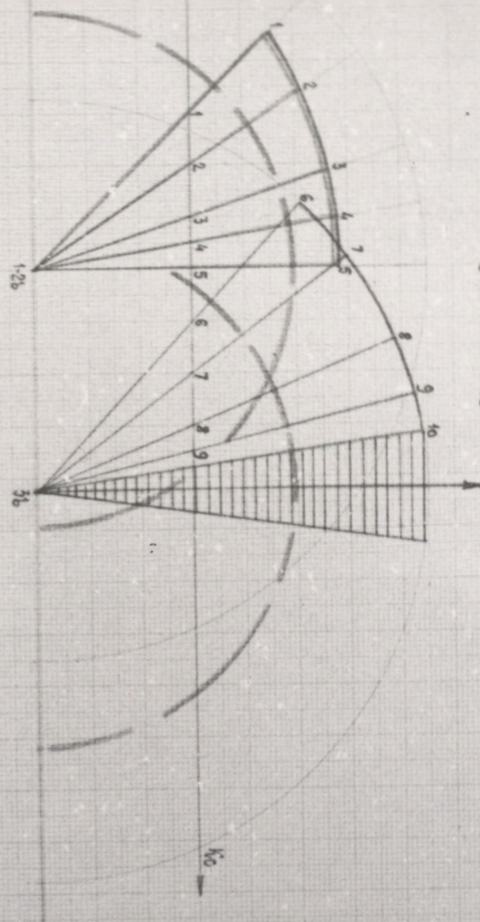
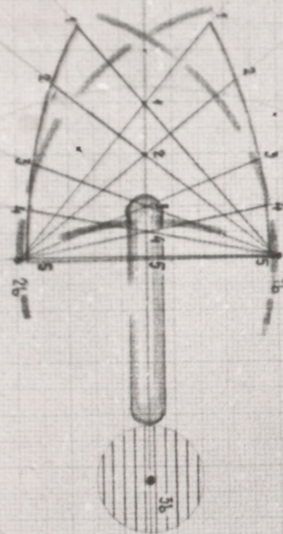
Średni czas ostrulowania $t_{\text{odr}} = 15 \text{ sek}$

1 lat: $t = 12 \text{ sek}$;

2 lat: $t = 12 \text{ sek}$;

3 lat: $t = 12 \text{ sek}$;

$R_0 = 3000 \text{ m}$
 $R_{\text{długość}} = 10 \text{ km}$
 $R_{\text{e}} = \text{średnica okręgu}$
 $R_{\text{e}} = 2 \text{ km}$



WYKRES NR 6 (D)

Wzrost	l_{a1}	l_1	l_2	l_3	l_4	l_5	l_6	l_7	l_8	l_9	l_{10}	P_{st}
3000	1	1300	1700	2100	2300	2400	-	-	-	-	-	P_{st}
	2	1300	1700	2100	2300	2400	-	-	-	-	-	
	3	-	-	-	-	-	-	-	-	-	-	
	4	1500	1500	900	100	-	-	-	-	-	-	R_{st}
	2	1500	1500	900	100	-	-	-	-	-	-	
	3	-	-	-	-	-	-	-	-	-	-	
	4	1600	2100	2600	2700	2800	-	-	-	-	-	P_{st}
	2	1600	2100	2600	2700	2800	-	-	-	-	-	
	3	-	-	-	-	-	-	-	-	-	-	
	3	-	-	-	-	-	1000	3000	3900	4200	4500	

$V_i = 333 \text{ m/s}$ (1200 km/h)

Ostrutisany odcinek drogi celu $\approx 7000 \text{ m}$

Ładunki mas strzelania $\approx 21 \text{ t}$

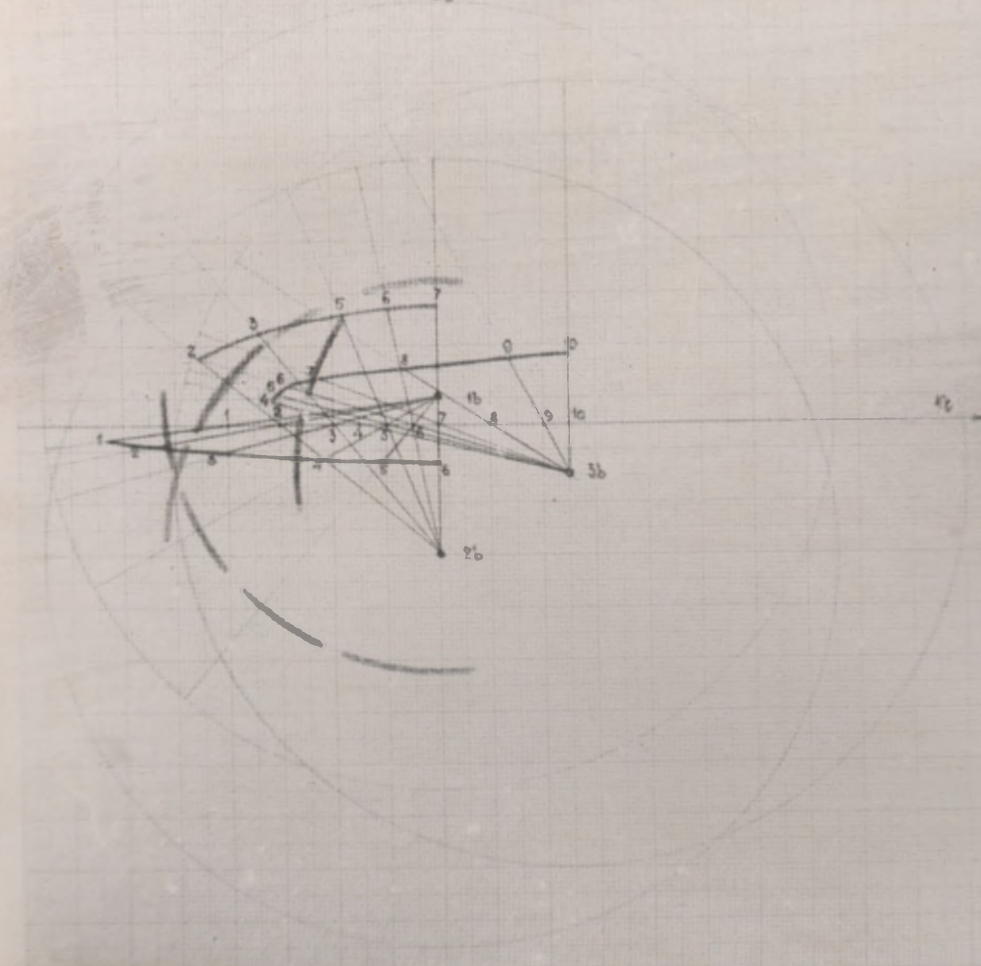
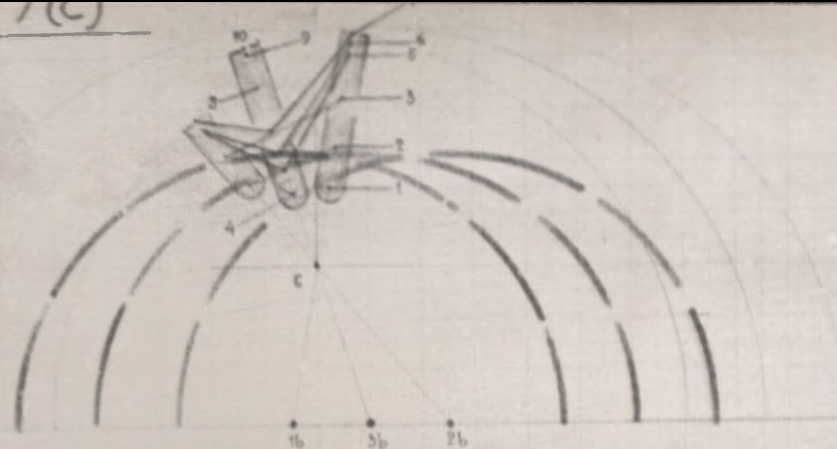
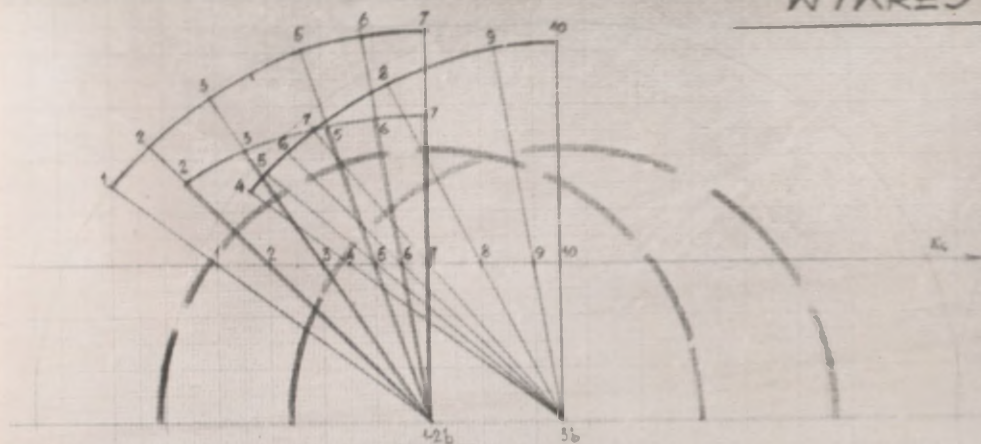
1 lot: 9 sek;

2 lot: 9 sek;

3 lot: 9 sek;

WYKRES NR 7 (C)

Skala: 1 cm = 10 km
Kt = 10 km od miejsca wypadku



Stacja	1b	2b	3b	4b	5b	6b	7b	8b	9b	10b	Stacja
1	100	400	700	1000	1300	1600	-	-	-	-	11b
2	-	1000	1300	1600	1900	2200	2500	-	-	-	12b
3	-	-	1000	1300	1600	1900	2200	2500	2800	3100	13b
4	1000	1300	1600	1900	2200	2500	-	-	-	-	14b
5	-	1000	1300	1600	1900	2200	2500	2800	3100	-	15b
6	1000	1300	1600	1900	2200	2500	2800	3100	-	-	16b
7	-	1000	1300	1600	1900	2200	2500	2800	3100	3400	17b
8	-	-	1000	1300	1600	1900	2200	2500	2800	3100	18b

$V_0 = 333 \text{ m/s}$ (1200 km/h)

Struktura: 1000 m

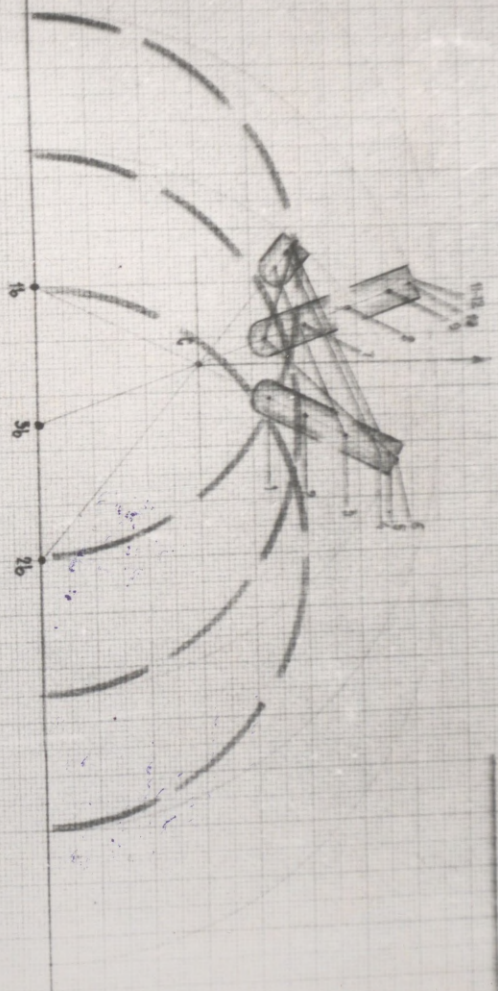
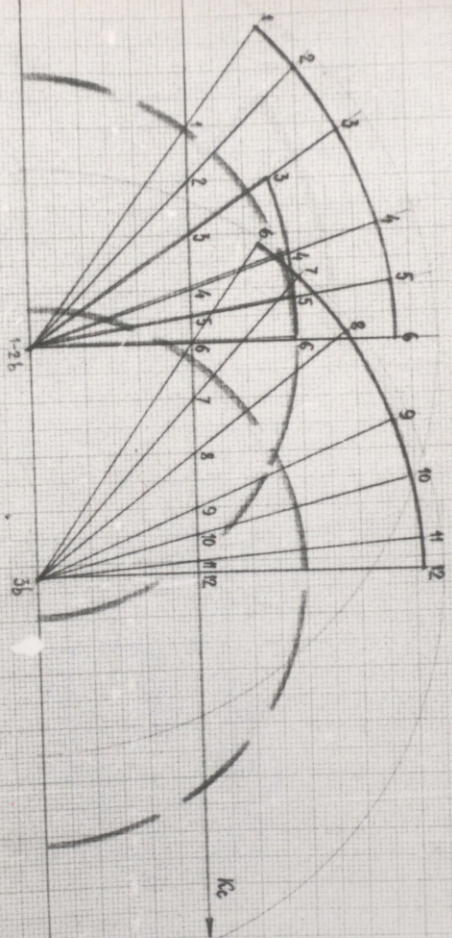
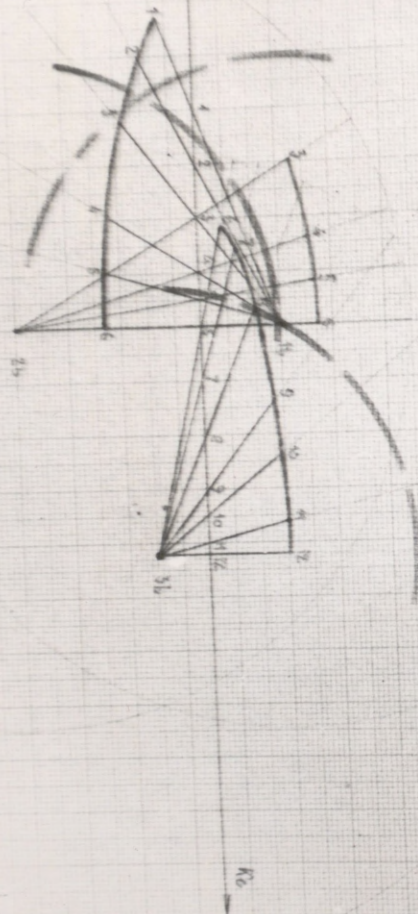
Struktura: 1000 m

1000 m

1000 m

1000 m

$V_c = 333 \text{ m/s}$
 $Q_{\text{stworzone}} = 1200 \text{ Kw/god}$
 $V_c = \text{długość czasu}$



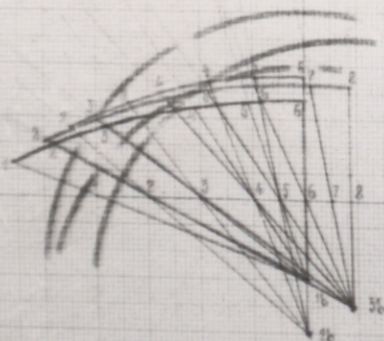
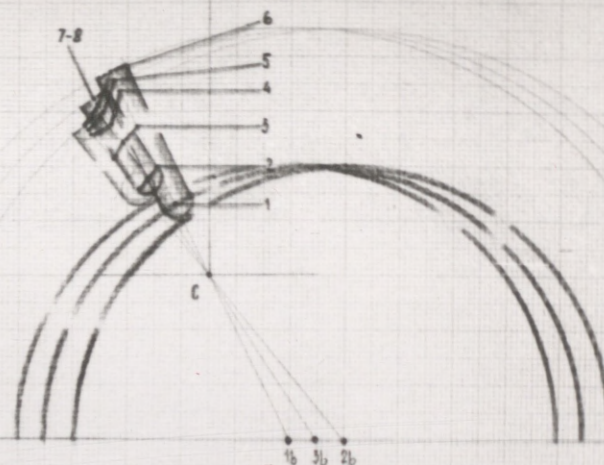
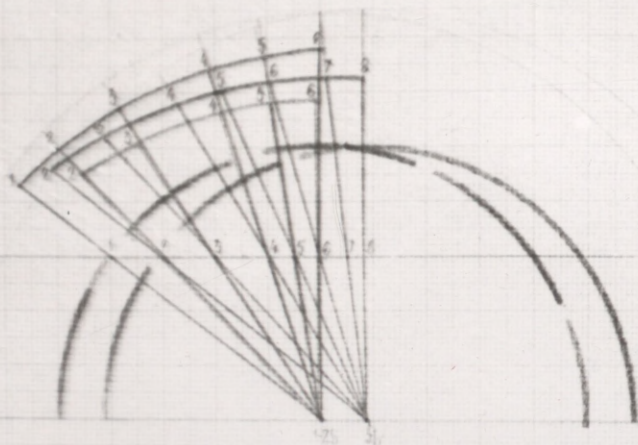
WYKRES NR 7 (D)

V_c w m	B_{st}	l_1	l_2	l_3	l_4	l_5	l_6	l_7	l_8	l_9	l_{10}	l_{11}	l_{12}	P_{st}
3000	1	700	1000	1300	1700	1800	1800	-	-	-	-	-	-	P_{st}
	2	-	-	700	2000	2100	2000	-	-	-	-	-	-	
	3	-	-	-	-	-	400	700	1000	1300	1400	1500	1600	
	4	1800	2000	1900	1100	600	-	-	-	-	-	-	-	P_{st}
	5	-	-	1000	600	300	-	-	-	-	-	-	-	
	6	-	-	-	-	-	800	2000	2100	1500	1000	300	-	
	7	1300	2000	2700	3400	3600	3700	-	-	-	-	-	-	P_{st}
	8	-	-	1500	1200	1900	1900	-	-	-	-	-	-	
	9	-	-	-	-	-	1200	2000	2900	3600	4000	4100	4700	

$V_c = 333 \text{ m/s}$ (1200 Kw/god)
 Odstawiany najmiej drugi silnik $\leq 2000 \text{ m}$
 Trzeci mas stowarnia $\leq 24 \text{ m}$
 1 lat : 12 sek;
 2 lat : 6 sek;
 3 lat : 12 sek;

WYKRES NR 8(A)

Średnica $m \pm 2$
 $R_c = 3000m$
 odstęp $h_{od} = 10$
 $R_c = 3000m$ od α
 w grupie



R_c, m	R_{od}	l_1	l_2	l_3	l_4	l_5	l_6	l_7	l_8	Part
3000	1	1600	900	1300	1700	1800	1900	-	-	
	2	-	1800	1800	2200	2400	2500	-	-	R_{od}
	3	-	1000	1400	1800	2000	2100	2200	2300	
	4	1100	1000	1800	1100	600	-	-	-	
	5	-	1500	1700	900	500	-	-	-	R_{od}
	6	-	2100	2100	1700	1400	1000	400	-	
	7	1300	2000	2700	3400	3600	3700	-	-	
	8	-	1600	2100	2600	2700	2800	-	-	R_{od}
	9	-	1800	2400	2750	3000	3200	3300	3300	

$V_c \approx 333 m/s$ (1200 km/h)

Obrotowy odstęp d_{od} : od α 5000 mm

Indeks α struktury: ≈ 15 sek

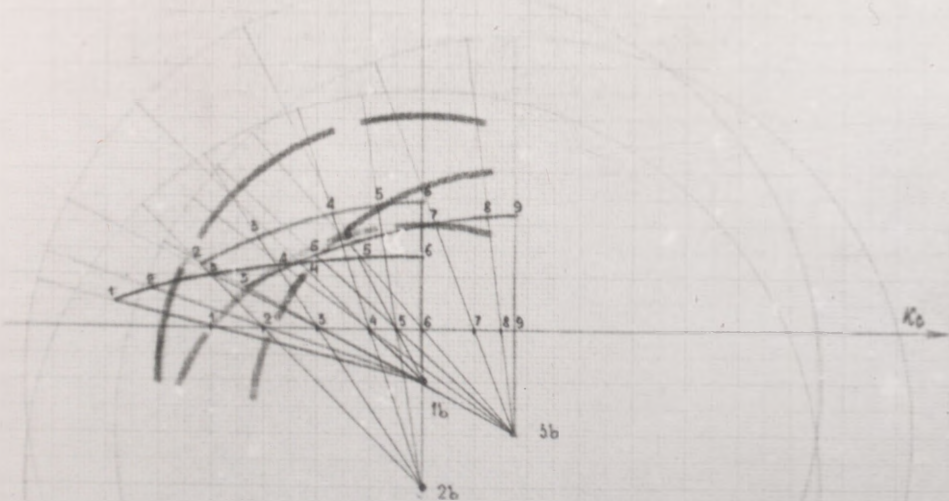
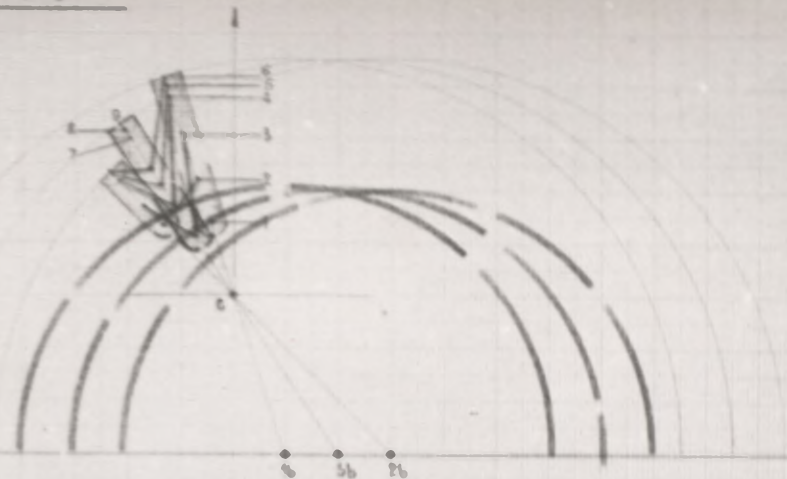
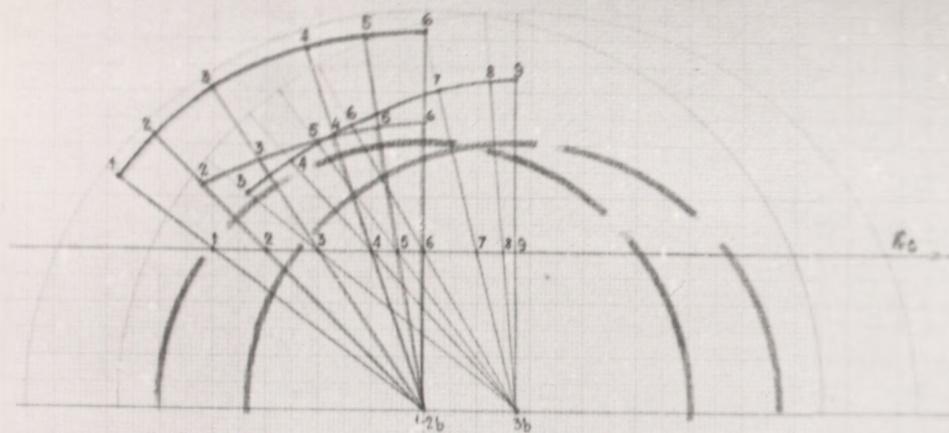
1. α : ≈ 12 sek;

2. α : ≈ 9 sek;

3. α : ≈ 12 sek;

WYKRES NR 8(B)

$R_c = 3000 \text{ m}$
 $R_{c1} = 3000 \text{ m}$
 $R_{c2} = 3000 \text{ m}$

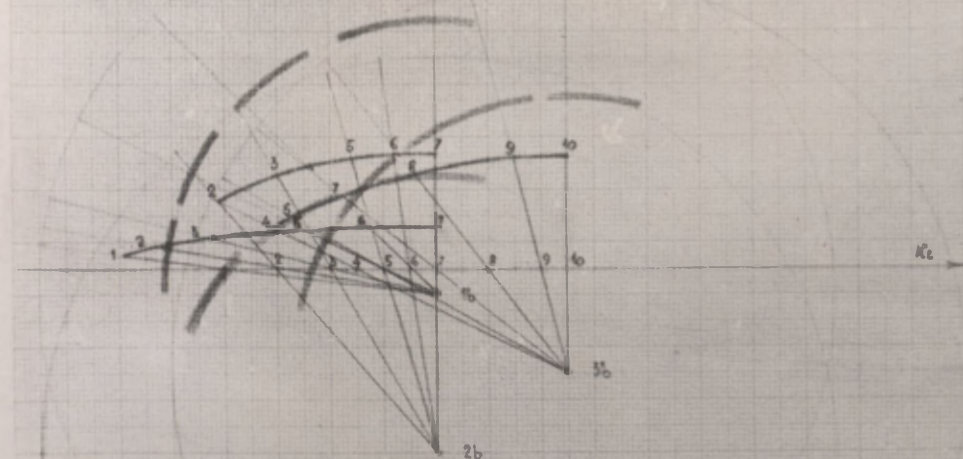
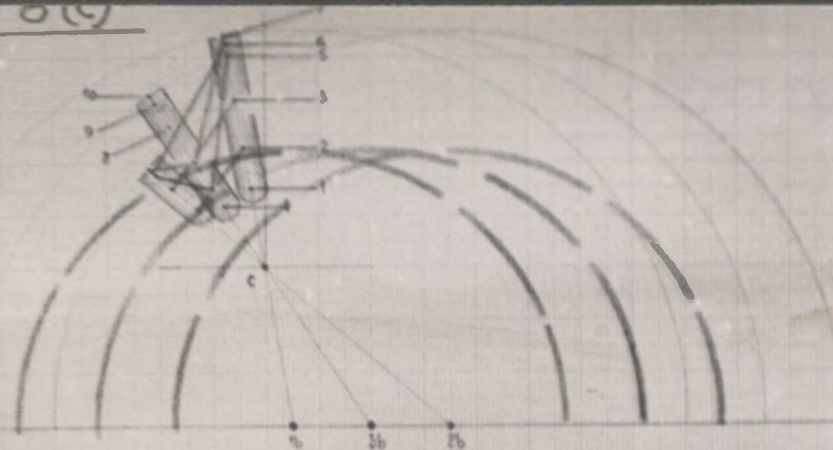
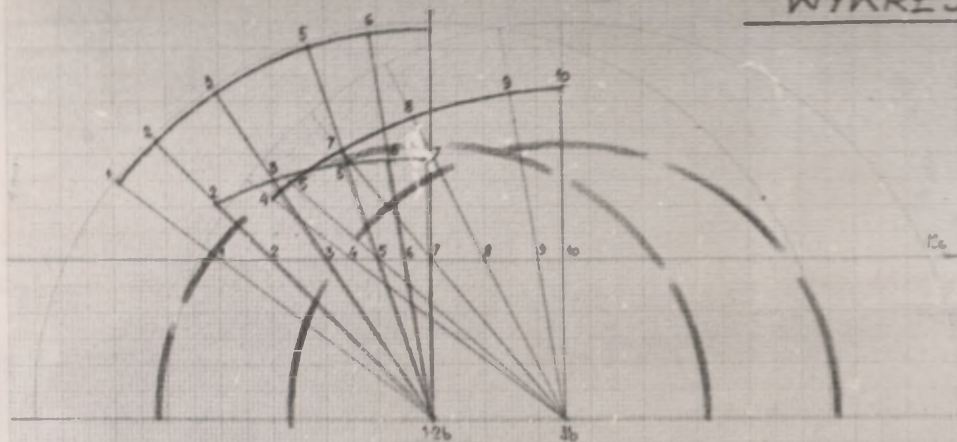


	R_{c1}	l_1	l_2	l_3	l_4	l_5	l_6	l_7	l_8	l_9	l_{10}	l_{11}	Sum
1	300	300	1000	1200	1800	1400	1400	-	-	-	-	-	9400
2	-	1200	1700	2200	2400	1400	-	-	-	-	-	-	9400
3	-	-	300	1100	1400	1600	2000	2200	1800	-	-	-	9400
4	1500	1100	2000	1300	600	-	-	-	-	-	-	-	9400
5	-	1200	1100	300	600	-	-	-	-	-	-	-	9400
6	-	-	1400	1100	1100	1400	800	300	-	-	-	-	9400
7	1400	2000	3400	3800	4000	2400	-	-	-	-	-	-	9400
8	-	1200	1700	1100	2300	2400	-	-	-	-	-	-	9400
9	-	-	1100	1700	2200	2500	3400	3200	2300	-	-	-	9400

$$V_c = 333 \text{ m/s} \quad (1200 \text{ km/h})$$

Odstawiony odcinek drogi: $\approx 6000 \text{ m}$

Prędkość: $\approx 19 \text{ m/s}$



	2b	1	2	3	4	5	6	7	8	9	10	Suma wzrostu
1	100	400	600	-	200	800	100	-	-	-	-	1000
2	-	100	100	-	200	100	100	-	-	-	-	1000
3	-	-	100	100	100	100	100	100	100	100	100	1000
4	100	100	100	100	100	100	100	100	100	100	100	1000
5	-	100	100	100	100	100	100	100	100	100	100	1000
6	-	-	100	100	100	100	100	100	100	100	100	1000
7	100	100	100	100	100	100	100	100	100	100	100	1000
8	-	100	100	100	100	100	100	100	100	100	100	1000
9	-	-	100	100	100	100	100	100	100	100	100	1000
10	-	-	-	100	100	100	100	100	100	100	100	1000

$$V_0 = 333 \text{ m/s (1200 km/h)}$$

Odstępy między drogami $\approx 6000 \text{ m}$

Ładunki $\approx 12 \text{ t}$

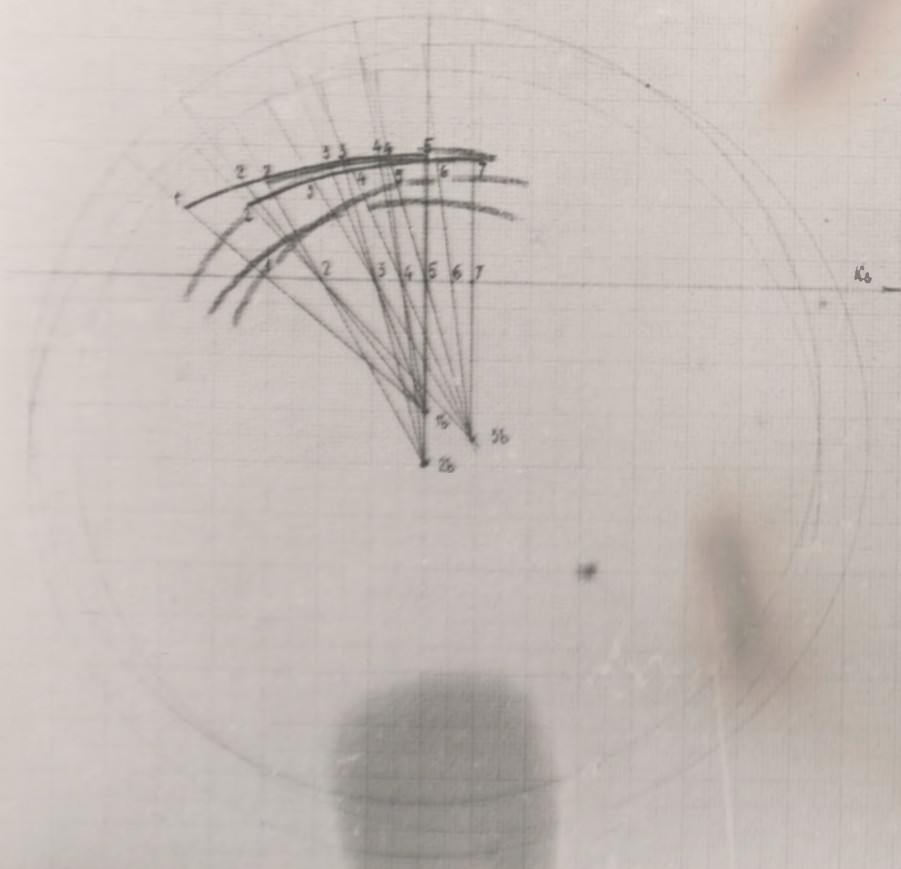
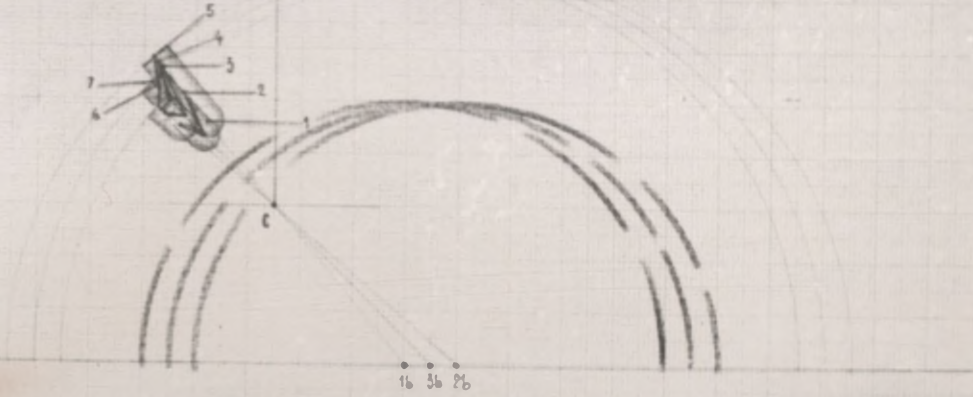
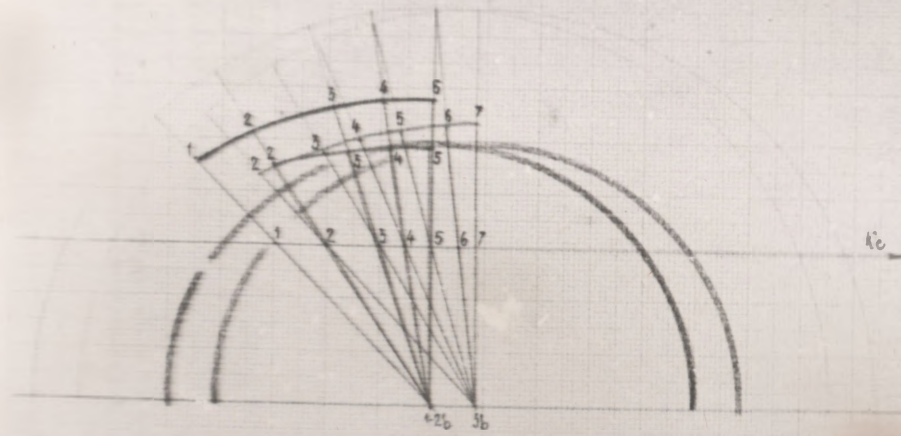
1. lot: 12 t

2. lot: 9 t

3. lot: 12 t

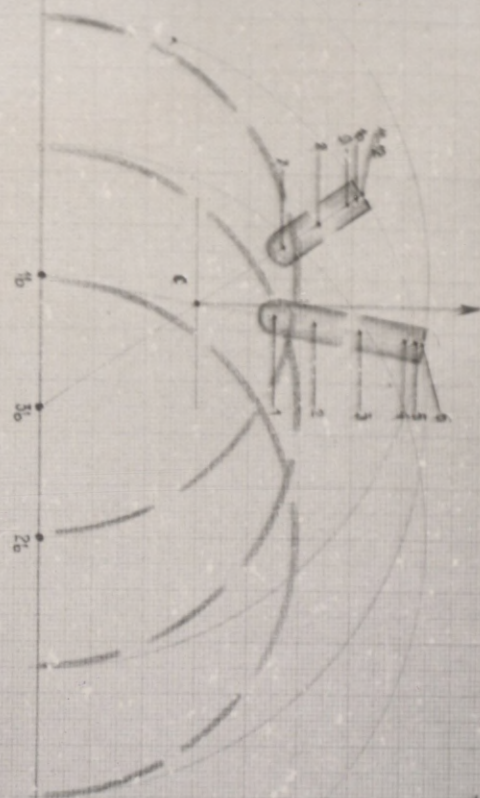
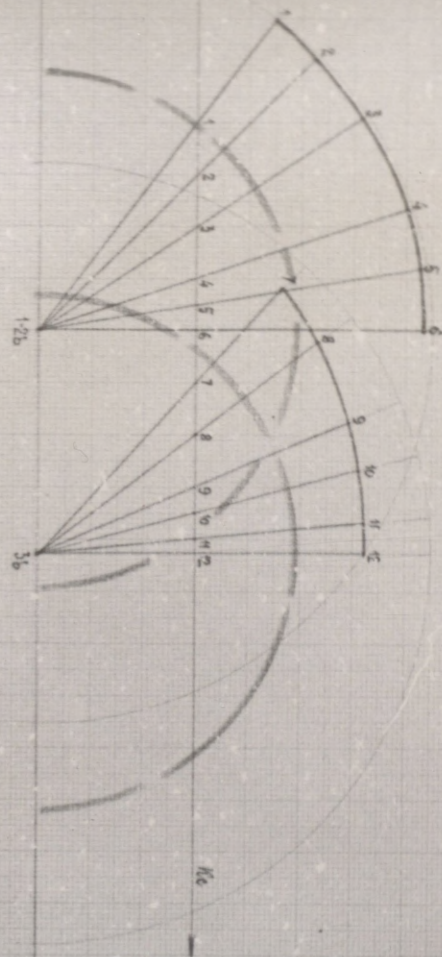
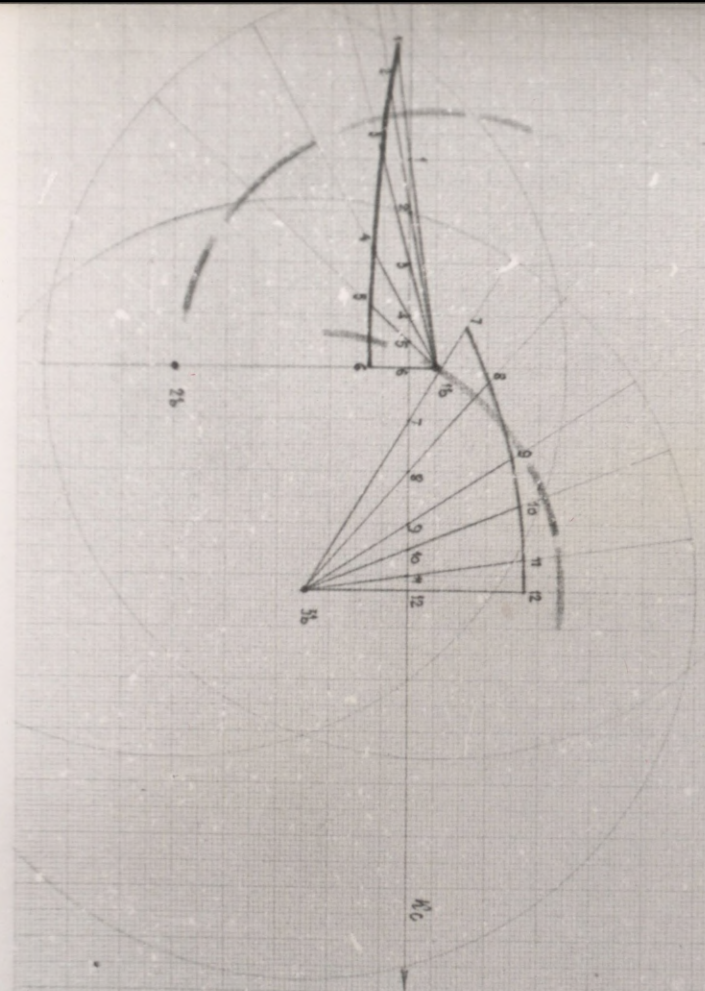
WYKRES NR 9 (A)

Stwierdzono, że
 $h_c = 3000 \text{ m}$
 odległość od
 $h_c = 2 \text{ km}$ od osi
 odległość



Wzrost	h ₁	h ₂	h ₃	h ₄	h ₅	h ₆	h ₇	h ₈	h ₉
1	1300	1200	2200	2400	2400	-	-	-	-
2	-	1300	2100	2200	2300	-	-	-	Part
3	-	1400	1900	2100	2000	2400	2400	-	-
4	1500	1400	900	500	-	-	-	-	-
5	-	1000	600	300	-	-	-	-	Part
6	-	1300	1100	900	600	300	-	-	-
7	1500	2100	2600	2700	2800	-	-	-	-
8	-	1600	1800	1800	1900	-	-	-	Part
9	-	1300	1700	2000	2200	2400	2400	-	-

$R_c = 3000 \text{ m}$
 Odległość bas. = 5 km
 $R_c = 20 \text{ km}$ od inwalidów
 w tym 10 km



WYKRES NR 8 (D)

$R_c = 3000$	3000	L_1	L_2	L_3	L_4	L_5	L_6	L_7	L_8	L_9	L_{10}	L_{11}	L_{12}	Part
1	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600	Part
2	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600	Part
3	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600	Part
4	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600	Part
5	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600	Part

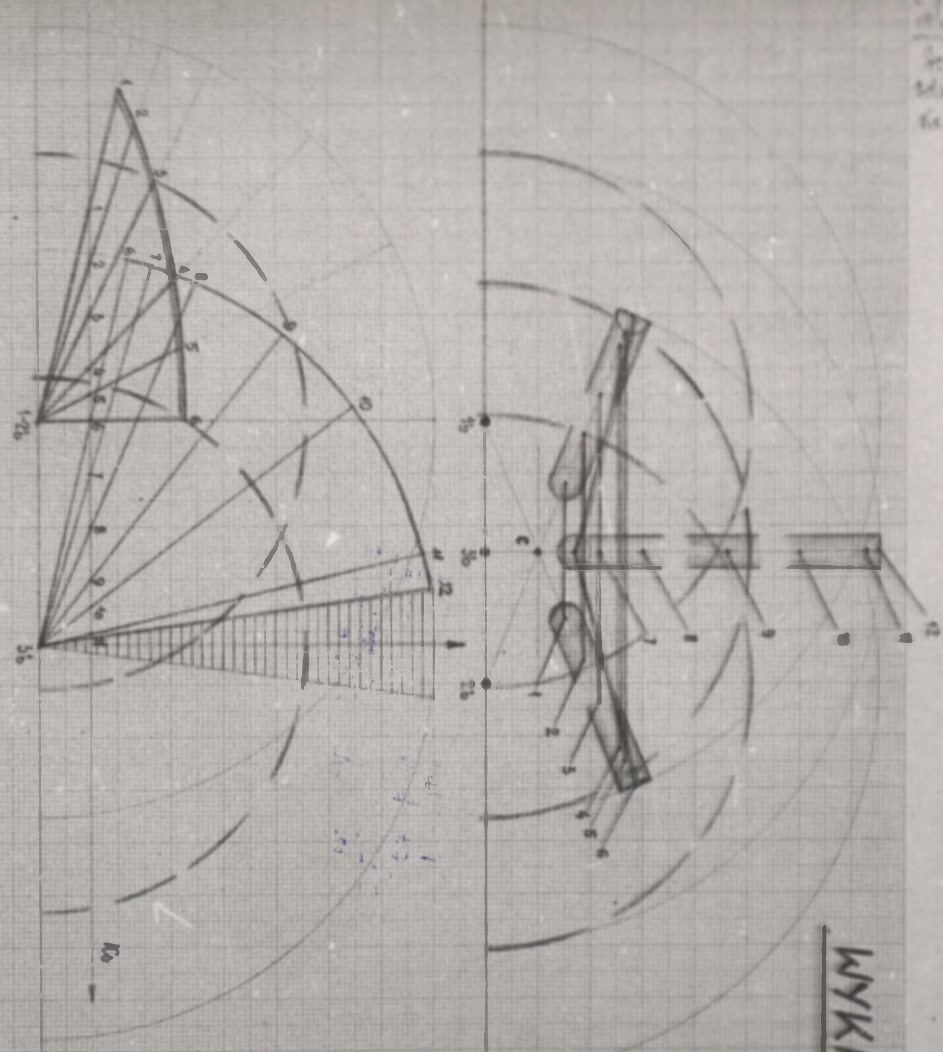
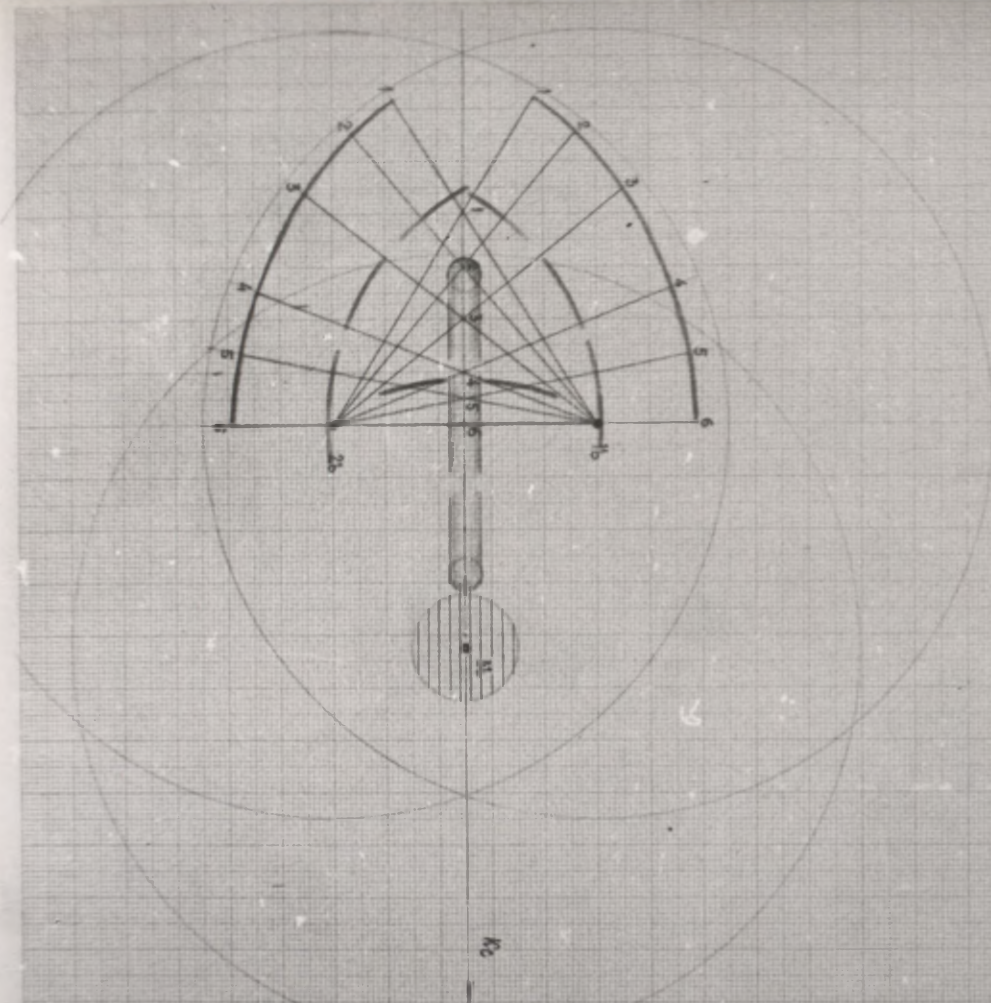
$R_c = 333 \text{ m/sok}$ (1200 km/pod)

Ostrzeżenie: odległość bas. = 2000 m

Łączna ilość stacji = 24 st.

1 bas: 12 st.

3 bas: 9 st.



Skala 1:1
 $R_c = 1000 \text{ mm}$
 $R_d = 1000 \text{ mm}$
 $R_e = 1000 \text{ mm}$

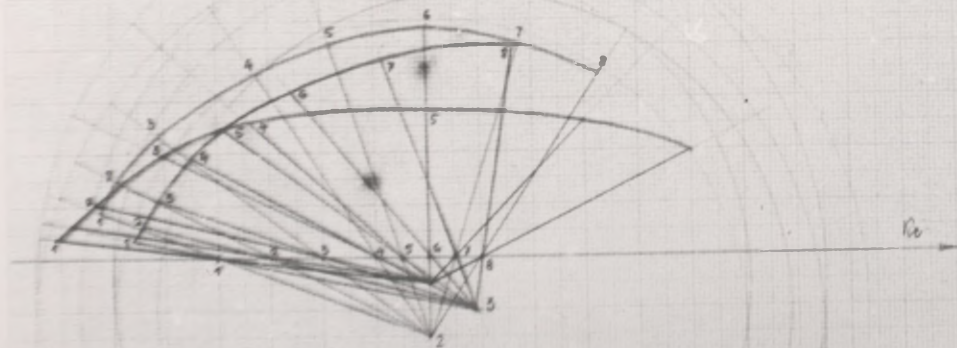
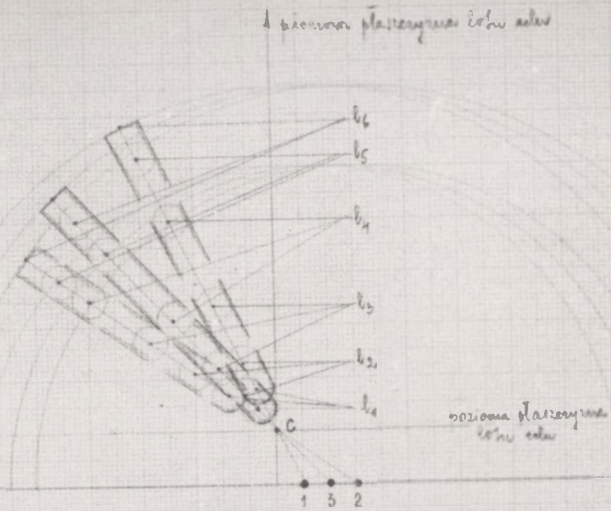
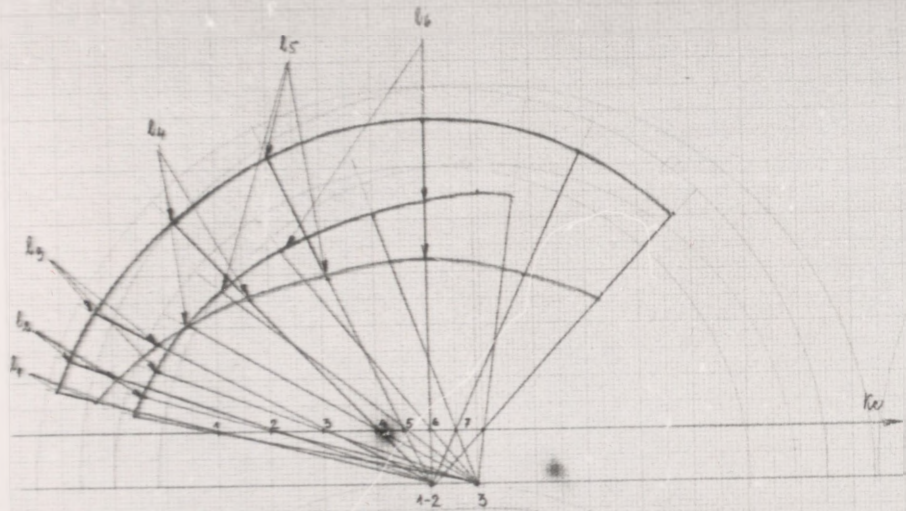
	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000
1	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200
2	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200
3	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200
4	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200
5	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200
6	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200
7	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200
8	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200
9	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200
10	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200
11	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200
12	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200
13	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200
14	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200
15	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200
16	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200
17	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200
18	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200
19	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200
20	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200

$V_c = 333 \text{ m/s}$ (1200 km/h)
 Ostrutiny srodku dorgi celu $\approx 2000 \text{ m}$
 Trochu nas strzelanie $\approx 24 \text{ sek}$
 1 sek: 12 sek;
 2 sek: 16 sek;
 3 sek: 12 sek;

WYKRES NR 1 (D)

WYKRES NR 2(A)

Schemat nr 2(A)
 $V_c = 1000 \text{ m/s}$
 $R_c = 1000 \text{ m}$
 $R_{\text{obs}} = 1000 \text{ m}$



l_i (m)	l_1	l_2	l_3	l_4	l_5	l_6	
	550	900	1100	2150	2800	3400	Wzts
							Wztn
1000	400	600	1100	2150	2800	3400	PntK
	3400	3800	4300	5400	5800	6800	Pntd
	900	1400	2200	2800	3700	5400	Pnt

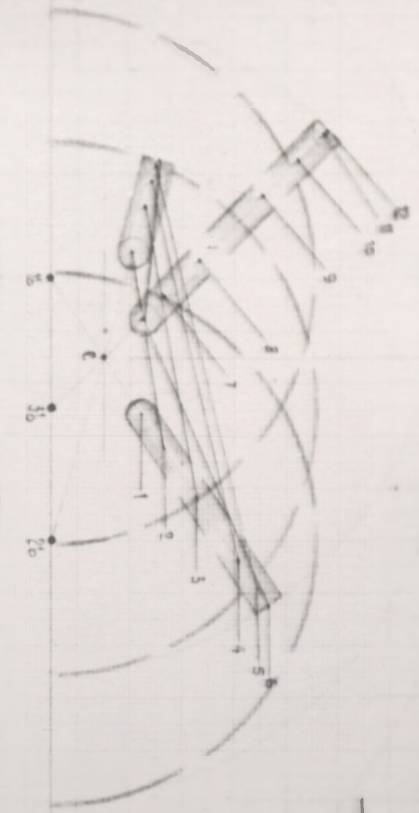
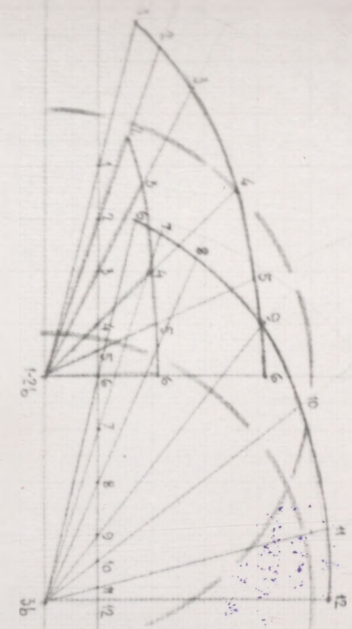
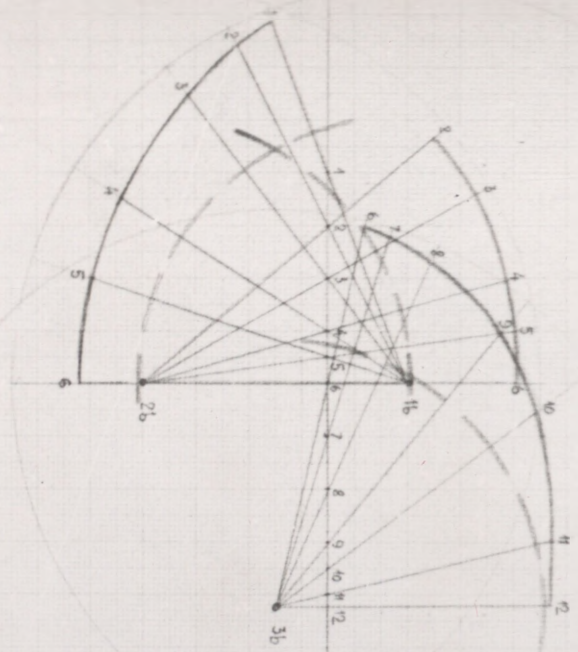


$V_c = 333 \text{ m/s}$ (1000 km/h)

Obliczony minimalny czas lotu $\approx 5000 \text{ m}$

czas na skrajnie $\approx 15 \text{ sek.}$

Obwód okr. 10
 Liczba dróg
 Odleg. 1000
 Liczba dróg okr. 1000

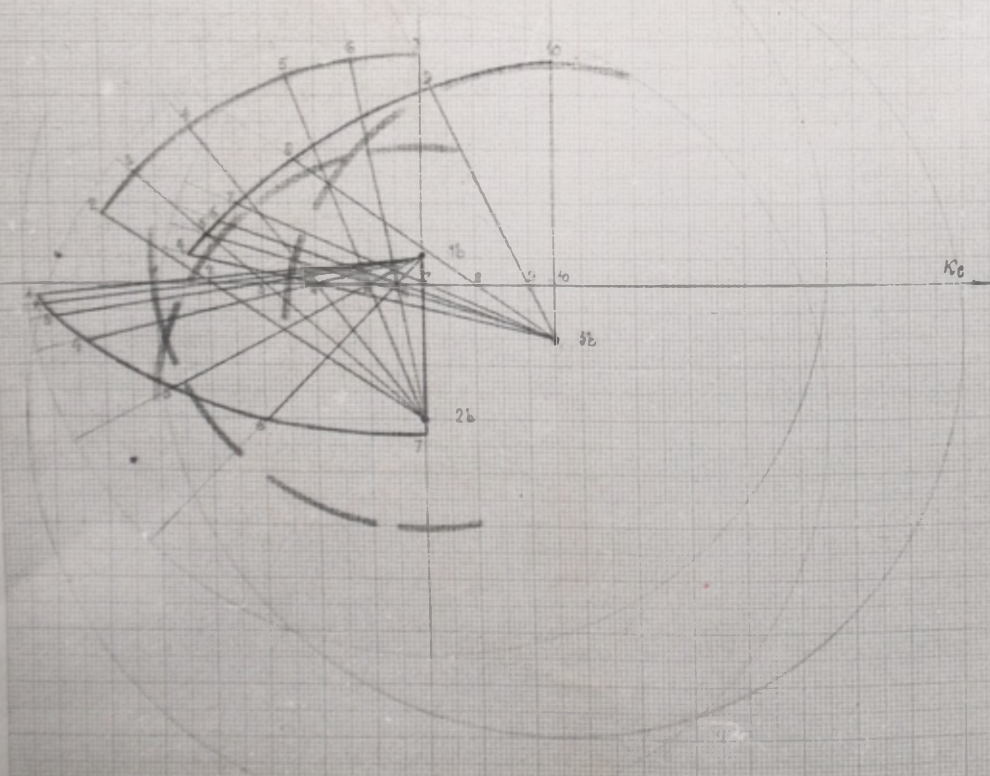
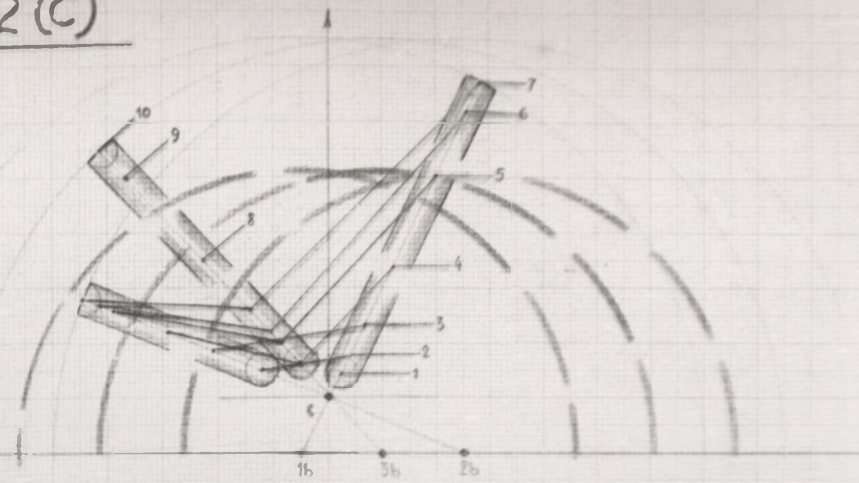
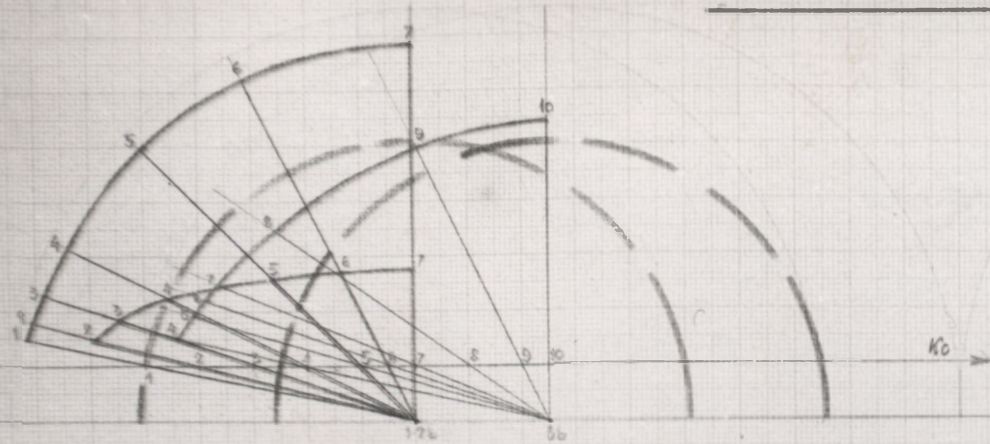


Dr. 1000	Per	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000
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$V_c = 333 \text{ m/sok}$ (1200 km/hod.)
 Obwód okr. 1000
 Liczba dróg okr. 1000
 Liczba dróg okr. 1000

WYKRES NR 2 (D)

WYKRES NR 2 (C)



№	l ₁	l ₂	l ₃	l ₄	l ₅	l ₆	l ₇	l ₈	l ₉	l ₁₀	R ₀
1	200	400	600	1100	1900	2500	2700	-	-	-	R ₀ + R ₁
2	-	1300	2100	2900	3400	4400	4700	-	-	-	
3	-	-	-	1500	2000	2200	2500	2600	3600	3700	
1	2500	3000	3700	4400	4800	2600	-	-	-	-	R ₀ + R ₂
2	-	2000	2500	2600	1600	1700	-	-	-	-	
3	-	-	-	2400	6200	3100	3600	3700	4200	-	
1	100	800	1300	2400	4800	3200	3700	-	-	-	R ₀ + R ₃
2	-	1500	900	1200	1600	1700	1700	-	-	-	
3	-	-	-	1600	1000	1300	1600	2600	4000	4300	

$V_0 = 323 \text{ m/s}$ (1200 km/h)

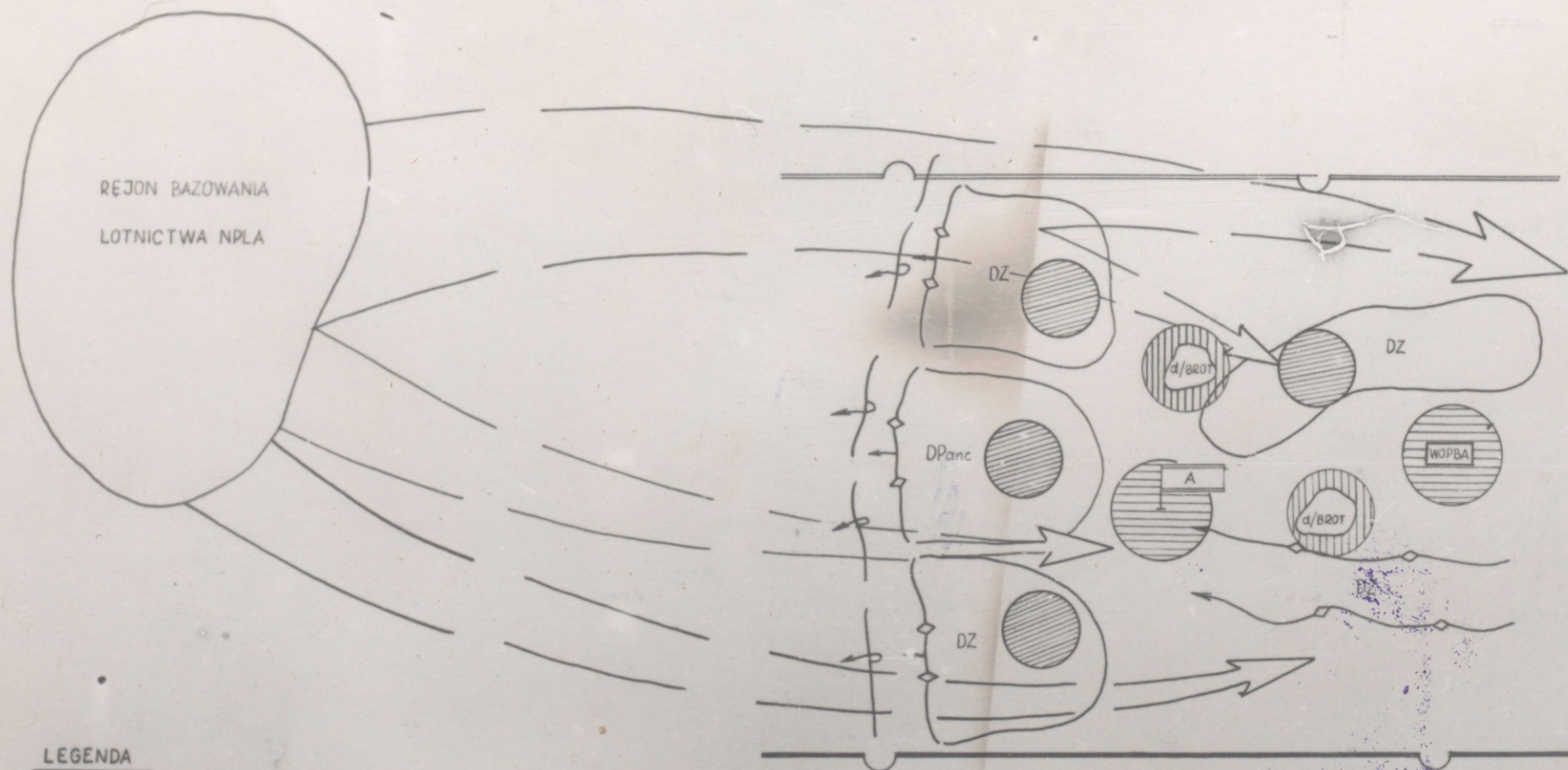
Strukturalny obrotowy drzewo 1000mm

Indukcyjny strukturalny 1200mm

R₀ = 1000mm
R₁ = 1000mm
R₂ = 1000mm

Rozmieszczenie stref ognia art. plot. w ugrupowaniu
operacyjnym armii
(Wariant)

Schemat nr. 1



LEGENDA

////// strefy ognia art. plot mk związków takt.

==== strefy ognia art. plot sk

||||| strefy ognia 3bat. mk i 3BAT sk

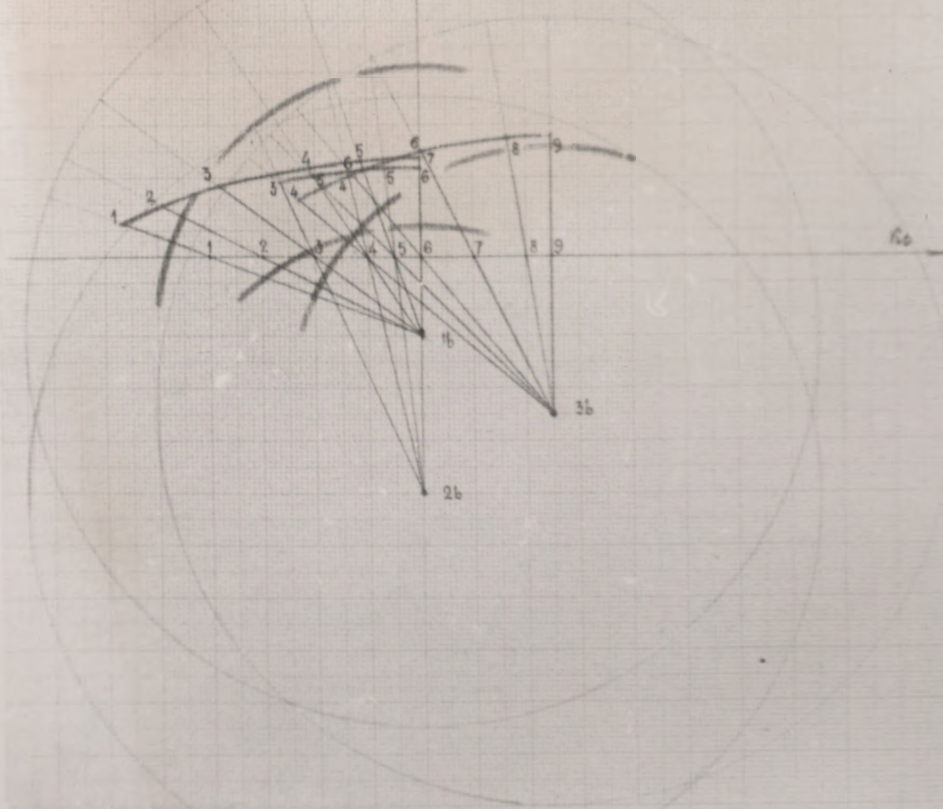
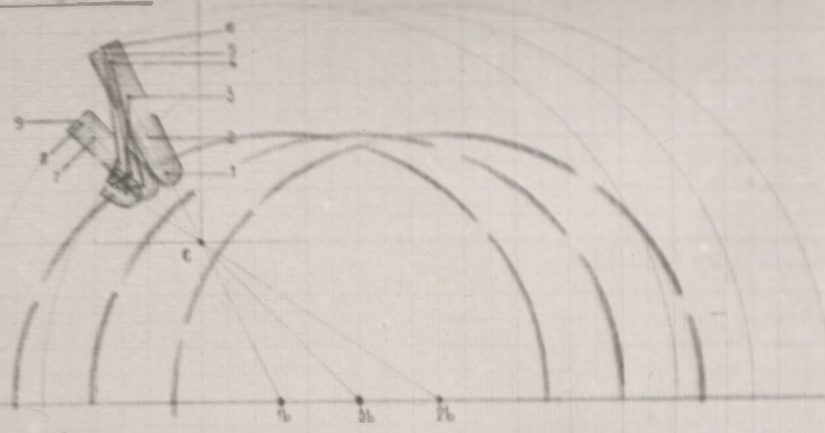
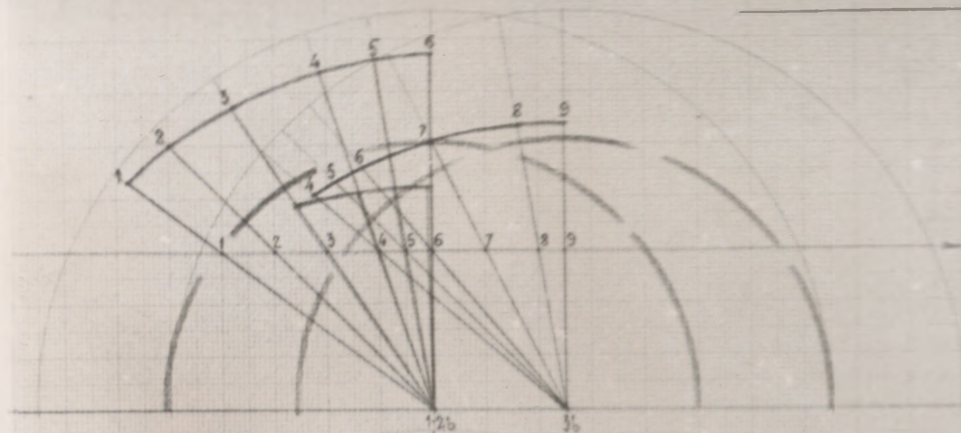
➔ Możliwe kierunki działania lotnictwa npla

0 10 20 30 40 50 km
skala

Armia dysponuje tylko organicznymi środkami art. plot.

WYKRES NR 9(C)

$S_0 = 3000 \text{ m}$
 $\text{Ciężar} \text{ } S_{01} = 3000 \text{ m}$
 $S_0 = 3000 \text{ m}$ (całkowicie)



$S_0 = 3000$	S_{01}	L_1	L_2	L_3	L_4	L_5	L_6	L_7	L_8	L_9	L_{10}	S_{01}
1	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
2	-	-	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
3	-	-	-	1800	1800	1800	1800	1800	1800	1800	1800	1800
4	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
5	-	-	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
6	-	-	-	1800	1800	1800	1800	1800	1800	1800	1800	1800
7	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
8	-	-	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
9	-	-	-	1800	1800	1800	1800	1800	1800	1800	1800	1800

$S_0 = 3000 \text{ m}$ (całkowicie)

Obciążenie śniegiem dachu wynosi 6000 m

Śnieg na strychu = 1800 m

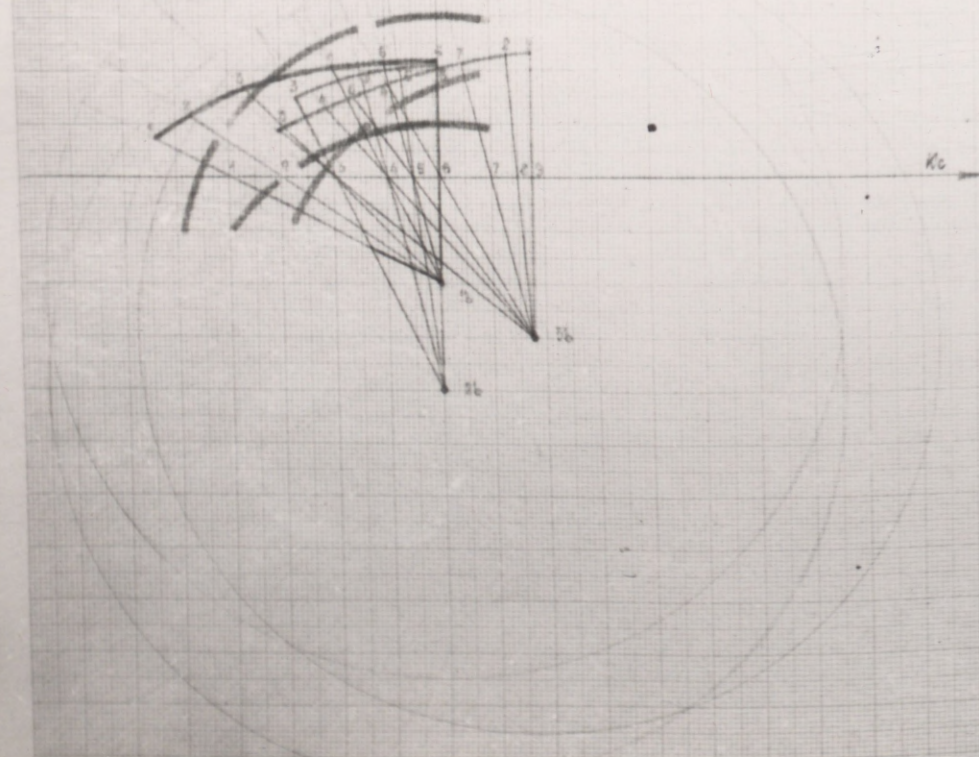
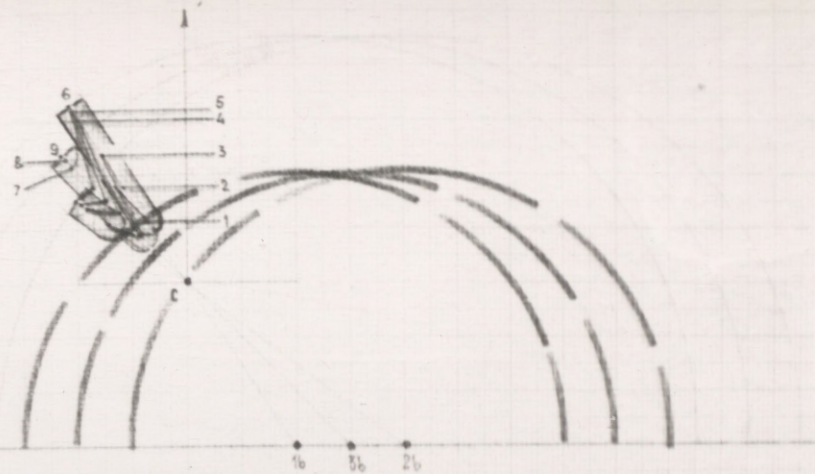
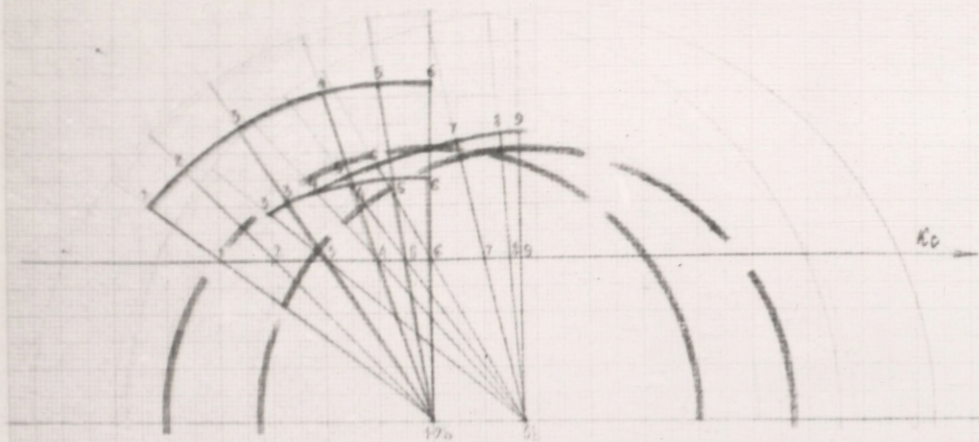
1. klatka: 1200 m

2. klatka: 600 m

3. klatka: 1800 m

WYKRES NR 9(B)

He = 3000 m
 Srednia lat. = 50°
 Kc =



Wariant	Bat	l_1	l_2	l_3	l_4	l_5	l_6	l_7	l_8	l_9	Suma wariantu
3000	1	200	1100	1600	2000	2100	2200	-	-	-	Partic
	2	-	-	1500	1900	2000	2100	-	-	-	
	3	-	-	900	1600	1500	1700	2100	2200	2300	
	4	1100	1200	1600	1000	500	-	-	-	-	Partic
	5	-	-	500	100	200	-	-	-	-	
	6	-	-	1100	1500	1200	1000	500	500	-	
	7	1100	1700	2500	3400	2300	1500	-	-	-	Partic
	8	-	-	1100	1400	1500	1600	-	-	-	
	9	-	-	900	1200	1500	1400	2100	2200	-	

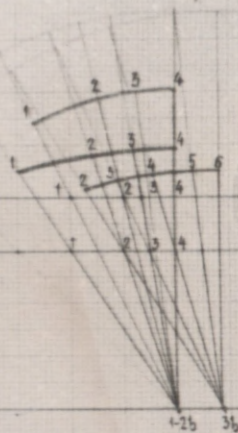
$$V_c = 333 \text{ m/min (1200 km/godz)}$$

Estymowany odśrodek drążki około 6000 mm

Średnica mas 1100 mm ± 10 mm

WYKRES NR 10(A)

$V_c = 3000 \text{ m/s}$
 Podległy ładunek 1000g
 $V_c = 4 \text{ km/s}$ od chwili
 odpalenia ład.



K_{ca}
 K_{ca}



K_{ca}

K_{ca}

$V_c \text{ m/s}$	3 lat	l_1	l_2	l_3	l_4	l_5	l_6	Put
3000	1	1600	2000	2100	2150	-	-	P_{ult}
	3	-	1600	1700	1900	2000	2100	P_{ult}
	4	1000	600	300	-	-	-	P_{ult}
	3	-	800	600	500	300	-	P_{ult}
	4	1500	1800	1800	1300	-	-	P_{ult}
	3	-	1150	1300	1400	1500	1500	P_{ult}
4000	2	1000	1400	1450	1500	-	-	P_{ult}
		700	700	300	-	-	-	P_{ult}
		1400	1900	2000	2100	-	-	P_{ult}

$V_c = 333 \text{ m/s}$ (1200 km/h)

Odstępy od linii drzewi od nr 1 $\approx 3000 \text{ m}$

nr 2 $\approx 2000 \text{ m}$

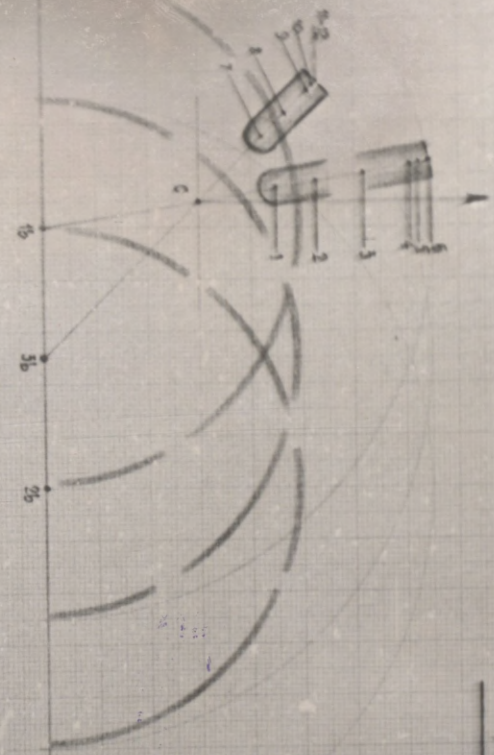
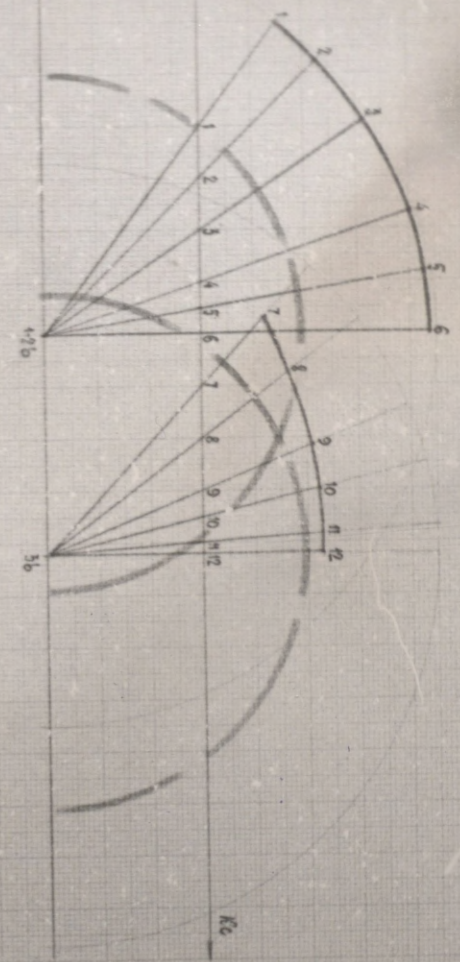
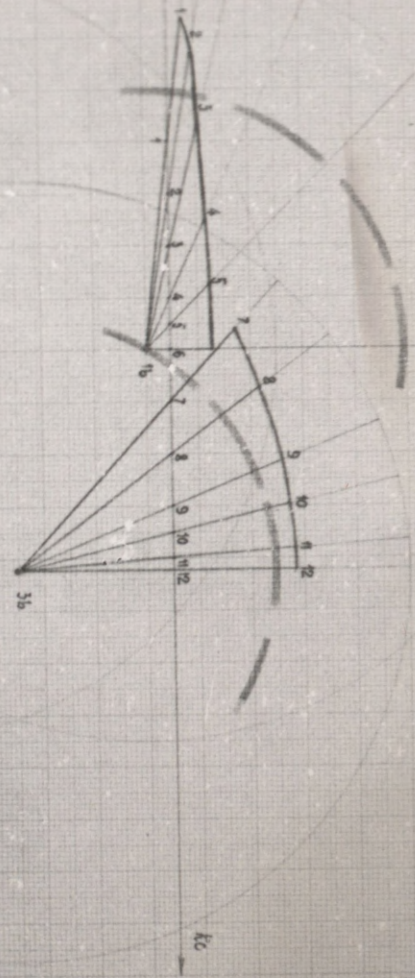
Ładunki mas stłumione do celu nr 1 $\approx 9 \text{ ton}$

1 lat : 6 sek

3 lat : 6 sek

nr 2 : 6 sek

$R_0 = 3000 \text{ m}$
 długość kadłuba = 20 m
 20 - 30 m od śmigła
 długość kadłuba



$R_0 \text{ w m}$	z_{ob}	l_1	l_2	l_3	l_4	l_5	l_6	l_7	l_8	l_9	l_{10}	l_{11}	l_{12}	P_{st}
3000	1	200	400	500	700	800	800	-	-	-	-	-	-	$P_{st}k$
	3	-	-	-	-	-	-	1200	1700	2100	2200	2200	2300	$P_{st}d$
	1	2000	2200	2100	1800	700	-	-	1500	1300	900	500	200	$P_{st}d$
	3	-	-	-	-	-	-	-	-	-	-	-	-	$P_{st}k$
	1	1500	2100	3200	4000	4200	4400	-	-	-	-	-	-	$P_{st}k$
	3	-	-	-	-	-	-	1200	1700	2100	2200	2300	2300	

$V_c = 333 \text{ m/s}$ (1200 km/h)

Ostrzeliwanie pojedyncze drogą pełną ≈ 8000

Ładunek granatowy $\approx 24 \text{ sek}$

1 kad. 12 sek;

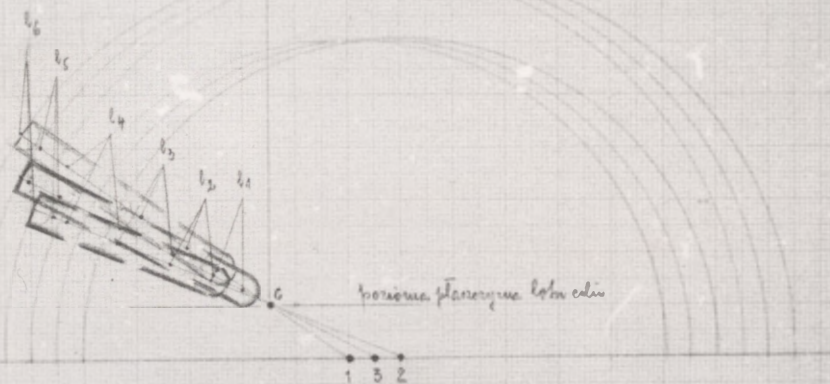
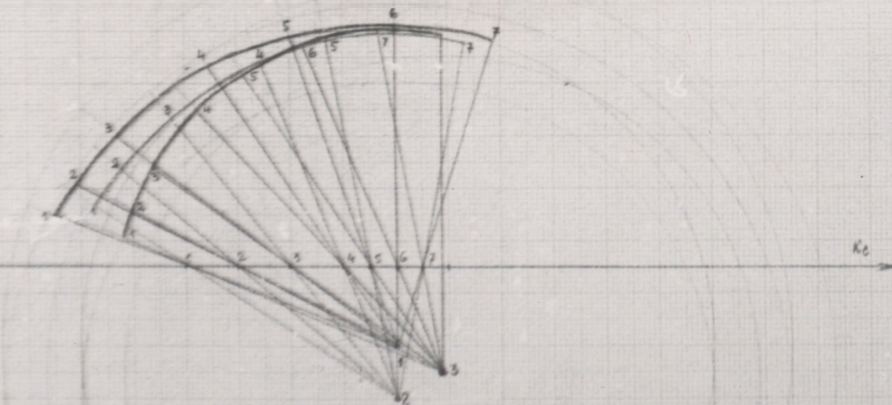
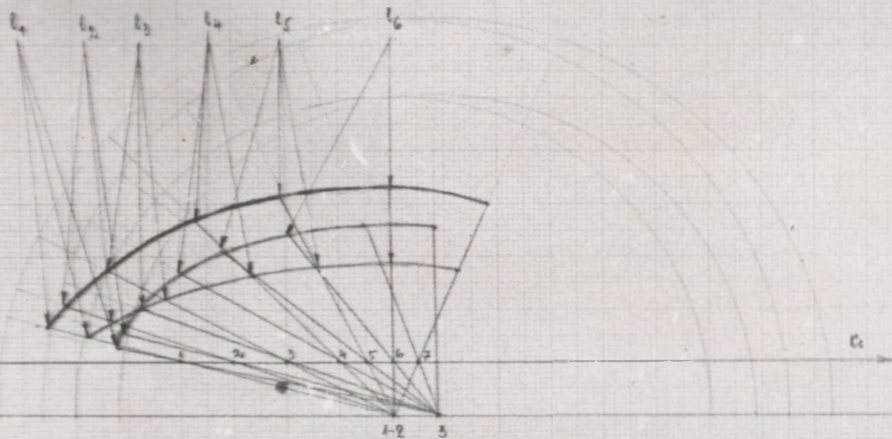
3 kad. 9 sek;

WYKRES NR 9 (D)

WYKRES NR 3 (A)

Wzrost: 180 cm
 Ciężar: 70 kg
 Ciężar ciała: 10 kg
 Ciężar głowy: 10 kg

1. bieżnia, planowa, lotu celu



2. bieżnia, planowa, lotu celu

Wzrost	l_1	l_2	l_3	l_4	l_5	l_6	
1000	400	650	1000	1200	1500	1800	Wzrost
	200	500	650	1000	1350	1500	Wzrost
	1000	1550	2450	3200	3500	4450	Wzrost
	2550	3400	3350	3000	2700	2000	Wzrost
	200	800	1000	1500	1700	1850	Wzrost

podstawy projekcji
 rysunek 3. bieżnia

0 1 2 3 4 5 km

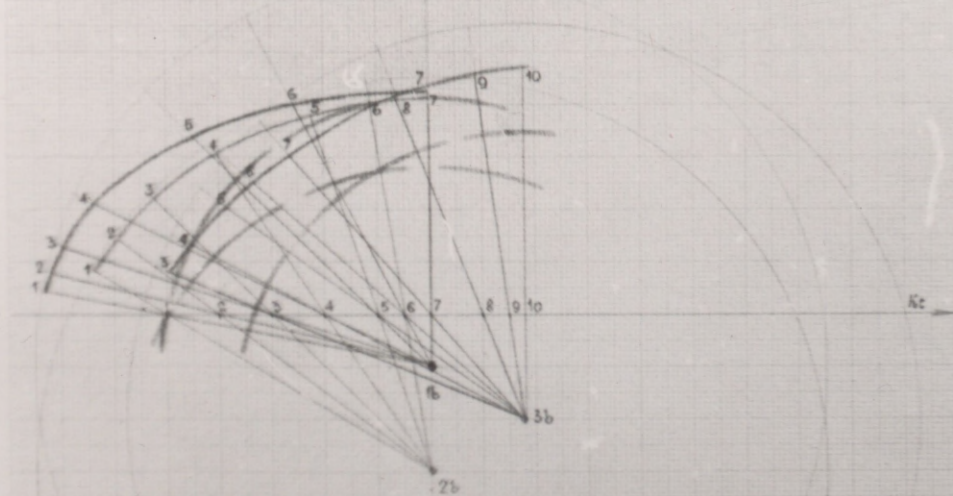
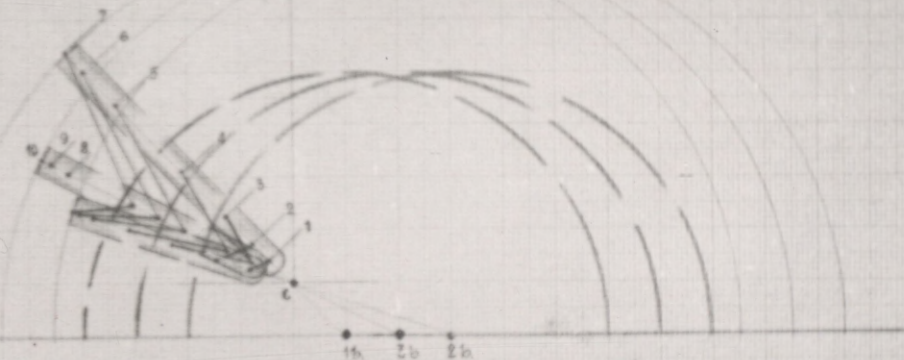
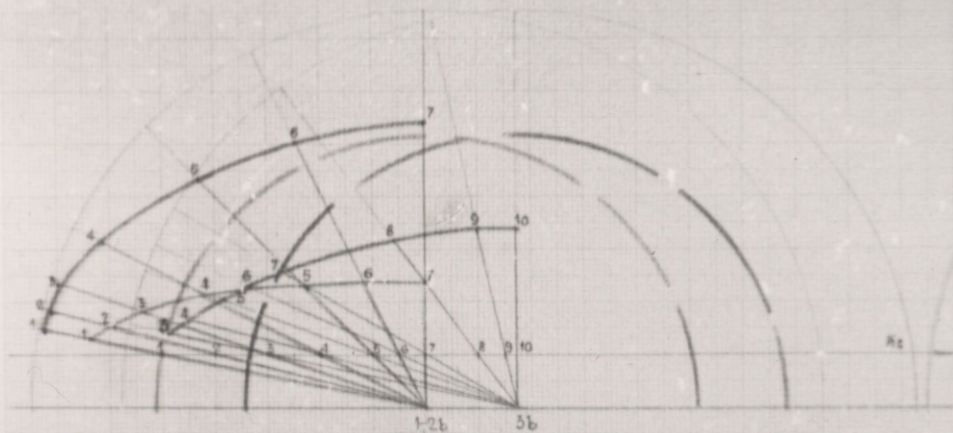
$V_c = 22.3 \text{ m/s}$ (1200 km/h)

Obrotowa odległość drogi lotu celu = 1000 m

Łączna czas obrotowa = 15 sek.

WYKRES NR 3(B)

$R_0 = 1000 \text{ m}$
 $R_{\text{dop. lat.}} = 200 \text{ m}$
 $R_2 = 2 \text{ km od środka}$



$R_0 \text{ m}$	But	l_1	l_2	l_3	l_4	l_5	l_6	l_7	l_8	l_9	l_{10}	Wzrost
1000	1	450	800	1300	2100	3400	4000	4300	—	—	—	Patk
	2	800	1400	2200	3000	3800	4000	4100	—	—	—	
	3	—	—	800	1300	2000	2500	3000	4200	4600	4700	
	4	2400	3200	4000	4100	3200	2000	—	—	—	—	Patd
	5	1400	2000	2400	2200	1300	700	—	—	—	—	
	6	—	—	1900	2500	2800	2800	2700	4600	500	—	
	7	400	800	1200	2100	3400	4000	4400	—	—	—	Patb
	8	300	500	700	1000	1300	1550	2400	—	—	—	
	9	—	—	350	600	1000	1300	1500	2100	2800	2400	
	10	—	—	—	—	—	—	—	—	—	—	

0 1 2 3 4 5 km

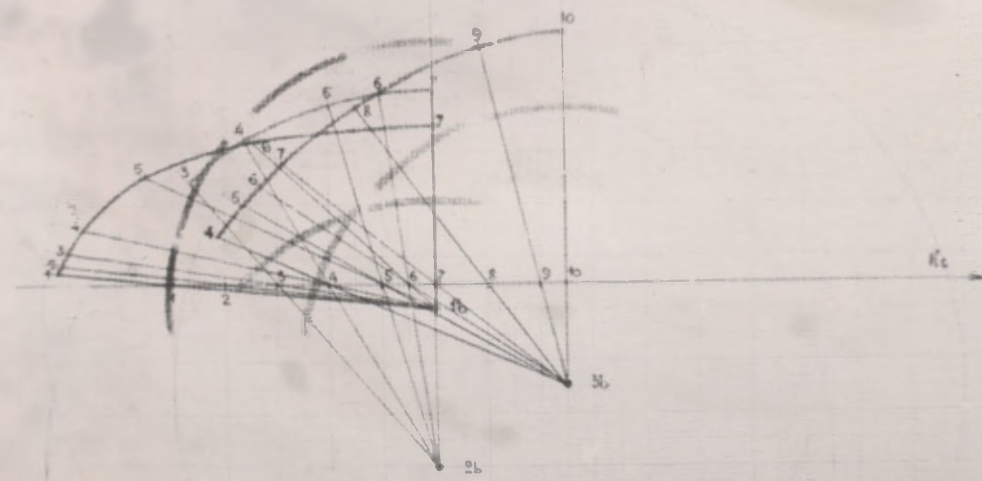
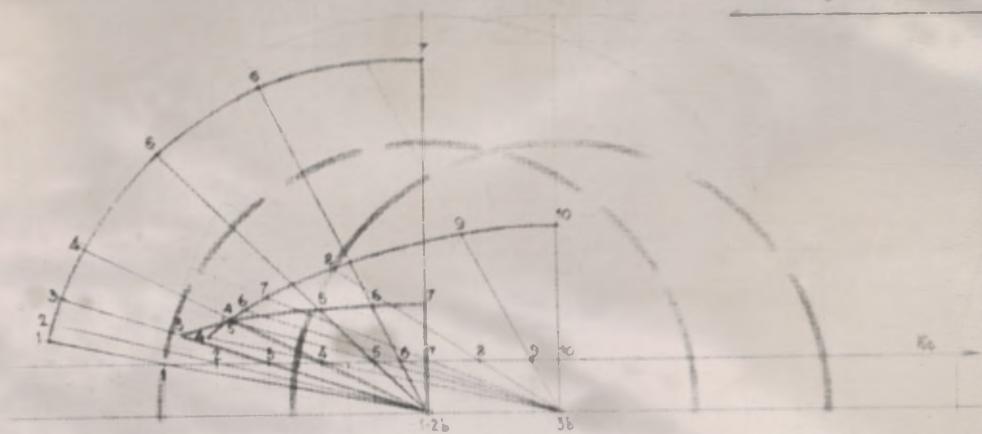
$V_c = 333 \text{ m/sok}$ (1200 km/hod)

Obliczenia odmioty drogę celi 7000m

Średnia mas atmosferyczna $\approx 21 \text{ sek.}$

WYKRES NR 3(C)

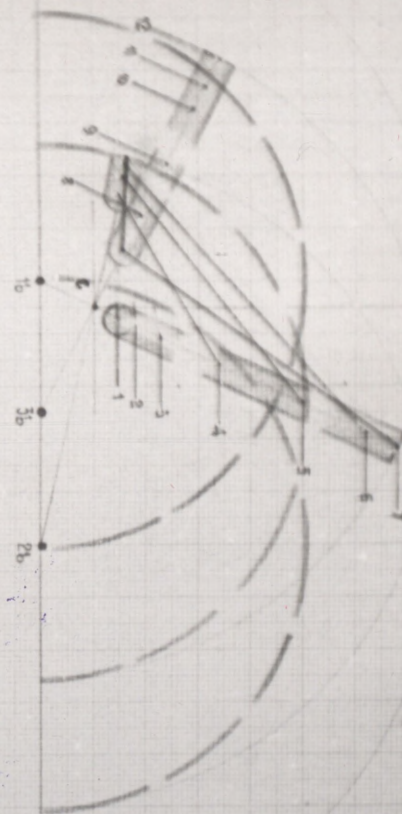
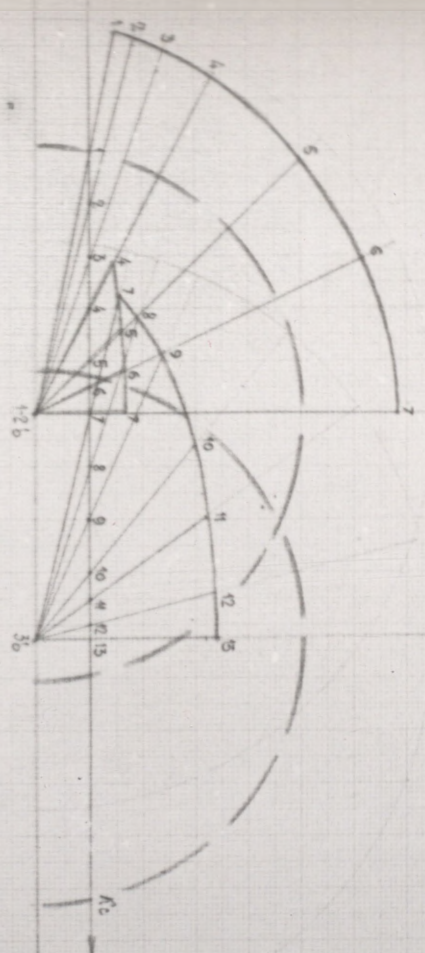
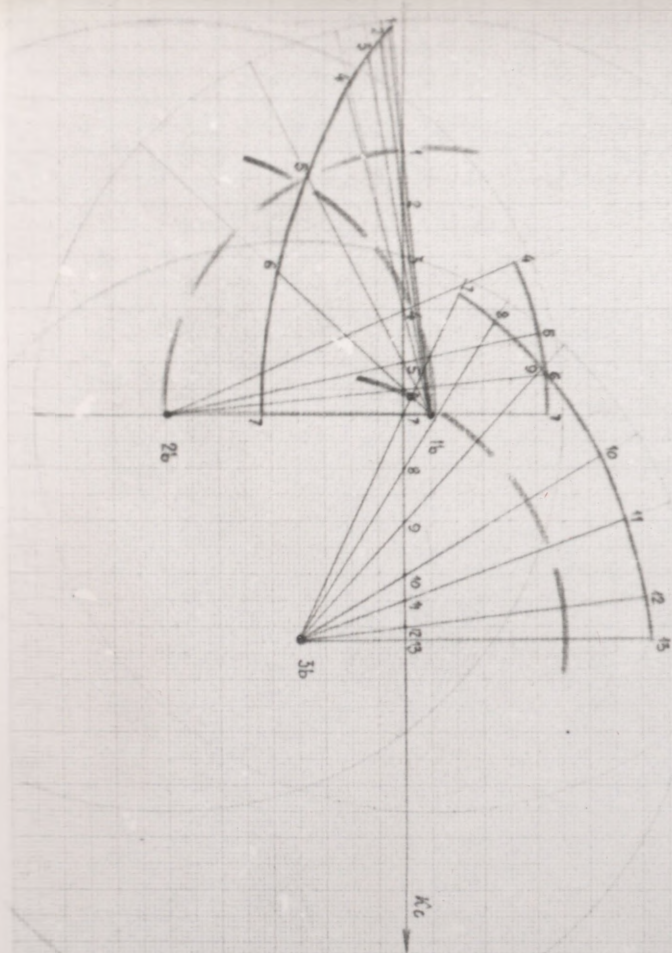
$R_0 = 1000 \text{ m}$
 $R_1 = 1000 \text{ m}$
 $R_2 = 1000 \text{ m}$



Prz.	Bat.	l_1	l_2	l_3	l_4	l_5	l_6	l_7	l_8	l_9	l_{10}	Przebieg a. 1000
1	100	400	600	1000	2000	2700	3000	-	-	-	-	P+K
2	-	-	2000	2700	3000	3600	3200	-	-	-	-	P+K
3	-	-	-	1000	1500	1800	2300	2300	1700	1700	-	P+K
4	1000	300	200	1500	1000	800	-	-	-	-	-	P+K
5	-	-	1000	1000	1000	1000	-	-	-	-	-	P+K
6	-	-	2000	2700	3000	3600	3200	1800	1700	-	-	P+K
7	100	100	1300	2400	4000	5100	5700	-	-	-	-	P+K
8	-	-	1000	800	1000	1000	1100	-	-	-	-	P+K
9	-	-	-	100	800	1000	1300	1700	2400	3200	-	P+K

$V_0 = 33.3 \text{ m/s}$ (1200 km/h)
 Obliczenia wykonano dla $R_0 = 1000 \text{ m}$
 Prędkość w punkcie P_0 wynosi 15 m/s
 Prędkość w punkcie P_1 wynosi 9 m/s
 Prędkość w punkcie P_2 wynosi 14 m/s

$V_c = 1000 \text{ m/s}$
 Średnica kuli = 5 km
 Kąt widzenia = 120°



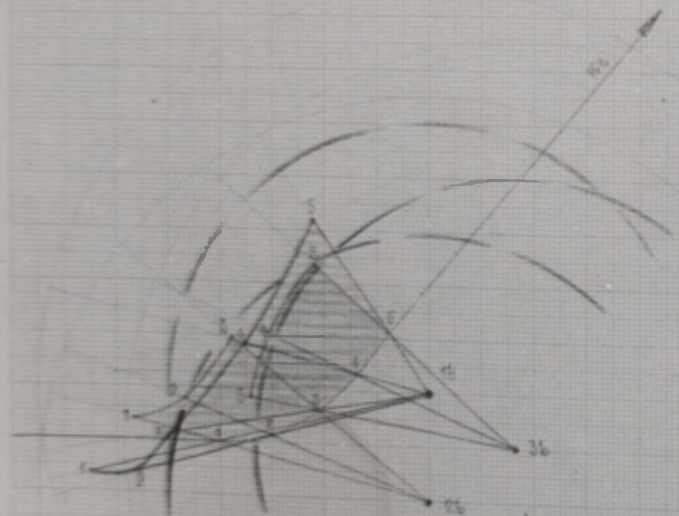
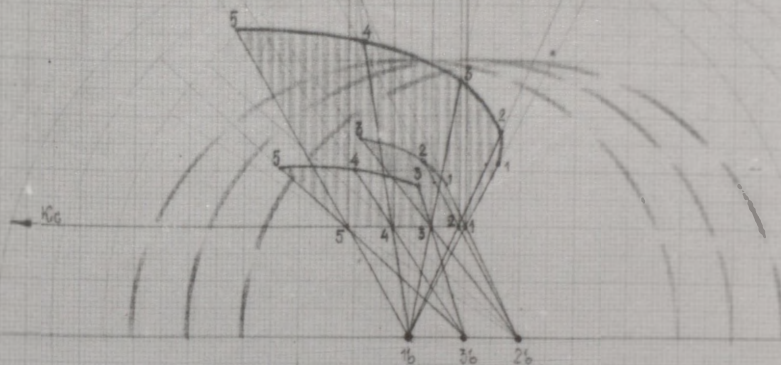
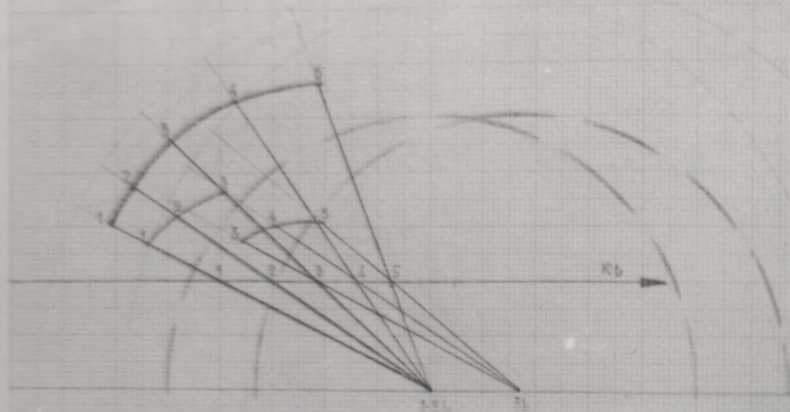
Wzrost	Długość	l_1	l_2	l_3	l_4	l_5	l_6	l_7	l_8	l_9	l_{10}	l_{11}	l_{12}	l_{13}	Prędkość
1000	1	200	400	600	1000	1800	2400	3700	-	-	-	-	-	-	Prędkość
	2	-	-	-	2000	2500	3600	3700	-	-	-	-	-	-	Prędkość
	3	-	-	-	-	-	-	1000	1700	3600	3700	4200	4600	4700	Prędkość
	4	2000	3200	3900	4400	3800	2500	-	-	-	-	-	-	-	Prędkość
	5	-	-	-	4000	3000	-	-	-	-	-	-	-	-	Prędkość
	6	-	-	-	-	-	-	2000	2800	3100	2400	1500	600	-	Prędkość
	7	450	800	1300	2400	4000	5200	-	-	-	-	-	-	-	Prędkość
	8	-	-	-	1000	600	600	700	-	-	-	-	-	-	Prędkość
	9	-	-	-	-	-	-	600	900	1400	1950	2200	2400	2400	Prędkość

$V_c = 333 \text{ m/sok}$ (1200 km/godz.)
 Odstawienie odcięcia drogi: $\approx 9000 \text{ m}$
 Łączna masa strzałami: $\approx 27 \text{ sok}$
 1. strzał: 15 sok;
 2. strzał: 6 sok;
 3. strzał: 12 sok;

WYKRES NR 3(E)

5 4 3 2 1

Skala: 1 cm = 10 m
 Wskazywanie: 10 m
 10 m
 10 m
 10 m



Obliczenie wartości składowej prędkości (m/s)

$$R = \frac{V_c^2}{g \sin \beta}$$

V_c - prędkość czołowa w m/s
 g - przyspieszenie ziemskie w m/s²
 β - kąt przechyłu toru jazdy względem poziomu

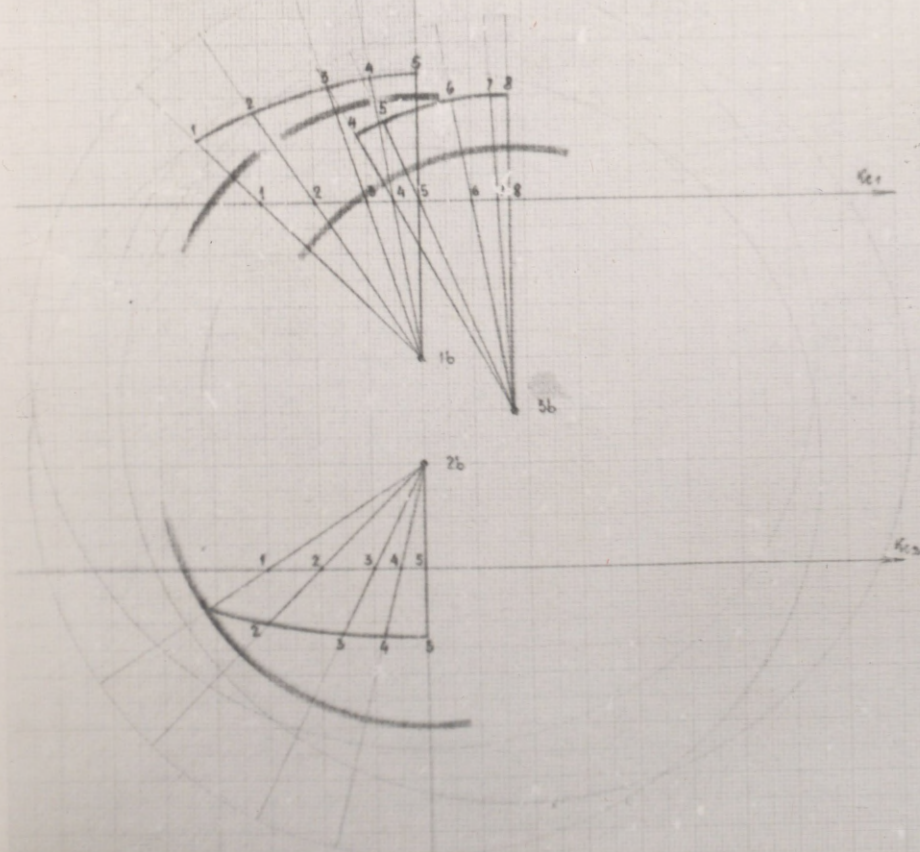
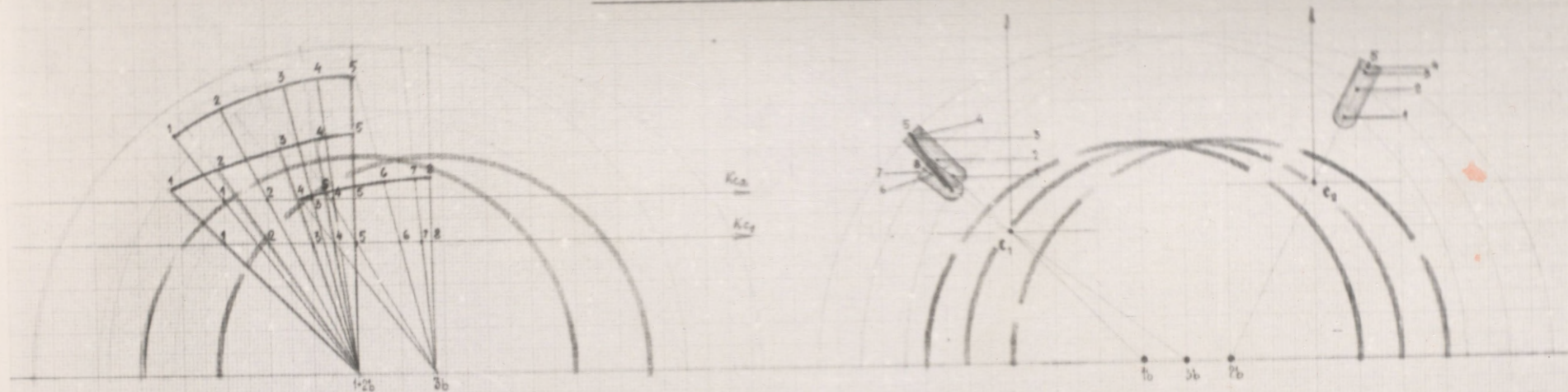
Dane:

$V_c = 300 \text{ m/s}$
 $g = 10 \text{ m/s}^2$
 $\beta = 70^\circ$
 $\sin \beta = 2.75$

$$R = \frac{(300 \frac{\text{m}}{\text{s}})^2}{10 \frac{\text{m}}{\text{s}^2} \cdot 2.75} = \frac{90000 \frac{\text{m}^2}{\text{s}^2}}{27.5 \frac{\text{m}}{\text{s}^2}} = 3272 \text{ m}$$

WYKRES NR 10(3)

$H_{e1} = 3000 \text{ m}$
 $H_{e2} = 4000 \text{ m}$
 Długość l. l. = 300 m
 $K_{e1} = 1000 \text{ m}$
 $K_{e2} = 2000 \text{ m}$



H _e w m	l ₁	l ₂	l ₃	l ₄	l ₅	l ₆	l ₇	l ₈	l ₉	l ₁₀	Result
3000	1	1500	1700	2200	2400	2700	-	-	-	-	R ₁ + R ₂
	2	-	-	-	1500	1900	2000	2200	-	-	R ₁ + R ₂
	3	1500	1700	2200	2400	-	-	-	-	-	R ₁ + R ₂
	4	-	-	-	1500	1900	2000	2200	-	-	R ₁ + R ₂
	5	1500	1700	2200	2400	-	-	-	-	-	R ₁ + R ₂
	6	-	-	-	1500	1900	2000	2200	-	-	R ₁ + R ₂
4000	1	1500	1700	2200	2400	2700	-	-	-	-	R ₁ + R ₂
	2	-	-	-	1500	1900	2000	2200	-	-	R ₁ + R ₂
	3	1500	1700	2200	2400	-	-	-	-	-	R ₁ + R ₂

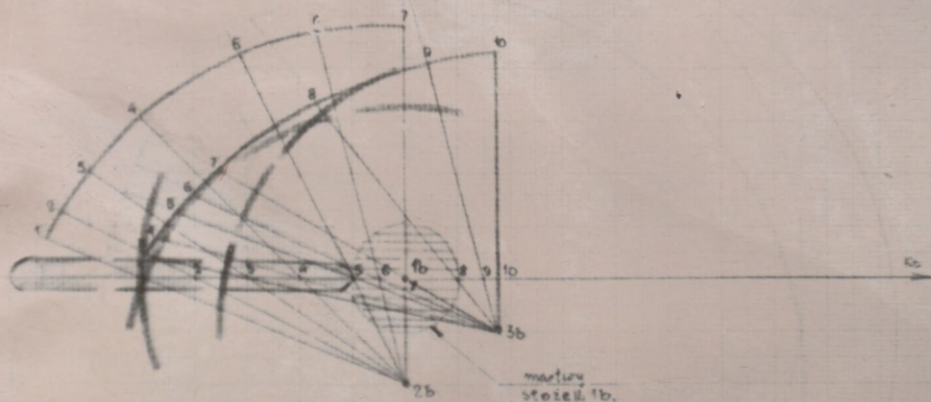
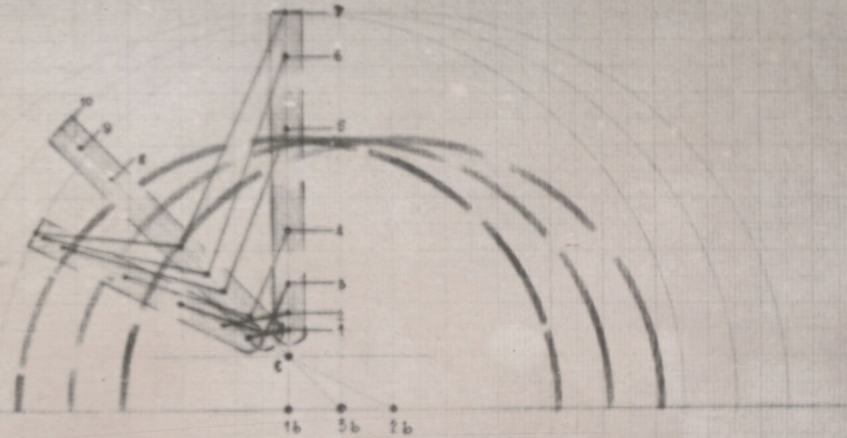
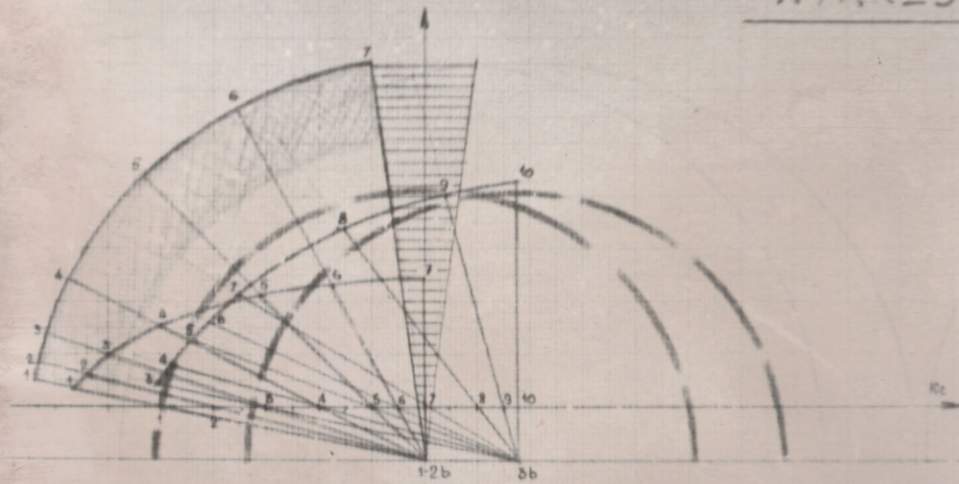
$$V_e = 333 \text{ m/sk} (1200 \text{ km/h})$$

Ostrutowanie odcinka drogi: nr 12 5000 m
 nr 24 3000 m

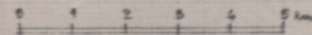
Ładunek mas strukturalna do raku: nr 1 15 m/sk
 nr 2 9 m/sk

WYKRES NR 2 (B)

$R_c = 1000 \text{ m}$
 $\text{odleg. lat.} = 20 \text{ km}$
 $R_c = 10 \text{ km}$ od punktu lat.



Pr. u. m.	2a, 5	l_1	l_2	l_3	l_4	l_5	l_6	l_7	l_8	l_9	l_{10}	Suma u. lat.
1000	1	—	—	—	—	—	—	—	—	—	—	R_{tk}
	2	750	1300	2000	3000	4300	4700	4800	—	—	—	
	3	—	—	500	800	1300	1600	2100	2300	1400	4200	
	4	2400	3300	4200	4800	4300	3000	800	—	—	—	R_{td}
	5	1200	2400	3000	3000	2100	1300	—	—	—	—	
	6	—	—	2000	2800	3500	3500	3500	2500	900	—	
	7	500	800	1400	2400	4300	5700	6500	—	—	—	R_{th}
	8	550	600	4000	1500	2100	2300	2400	—	—	—	
	9	—	—	400	800	1200	1600	2400	3400	4000	4200	



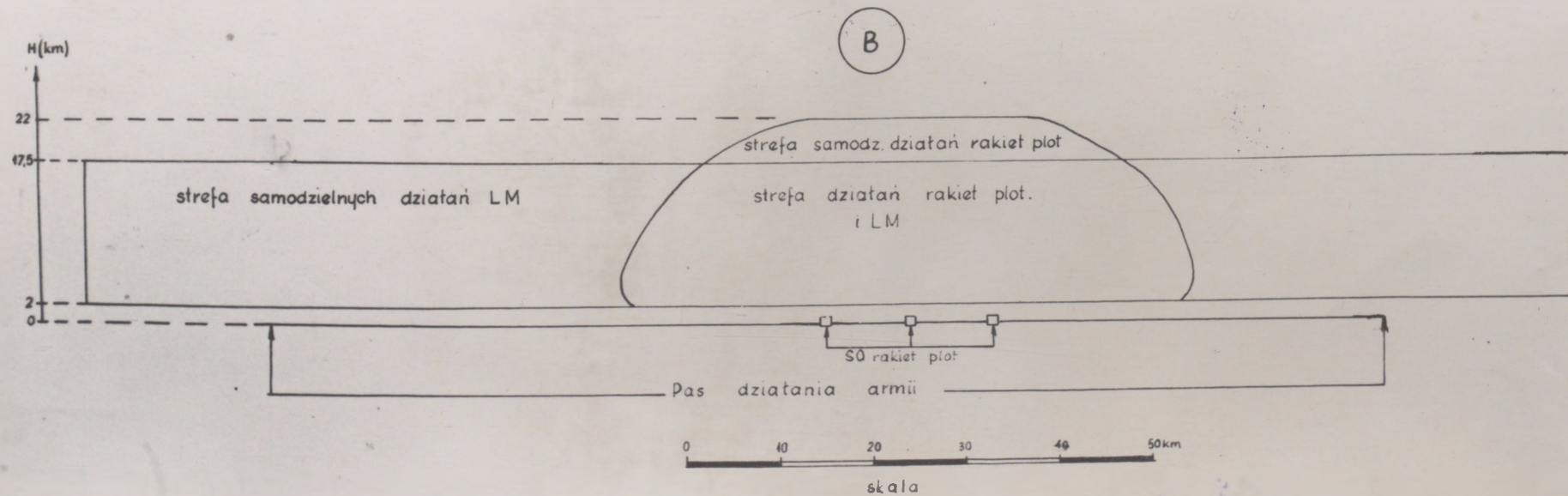
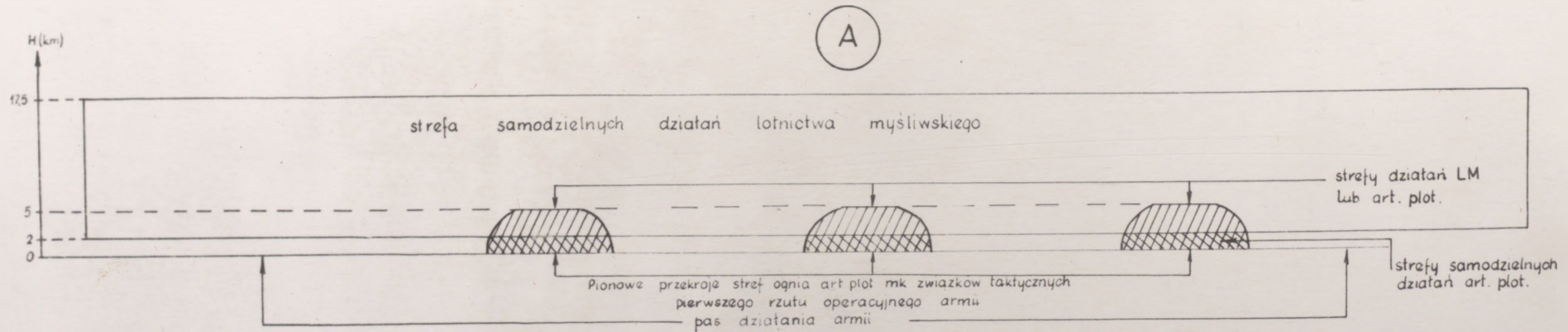
$R_c = 753 \text{ m/s}$ (1000 km/h)

Obliczenia odległości drogowej $\approx 7000 \text{ m}$

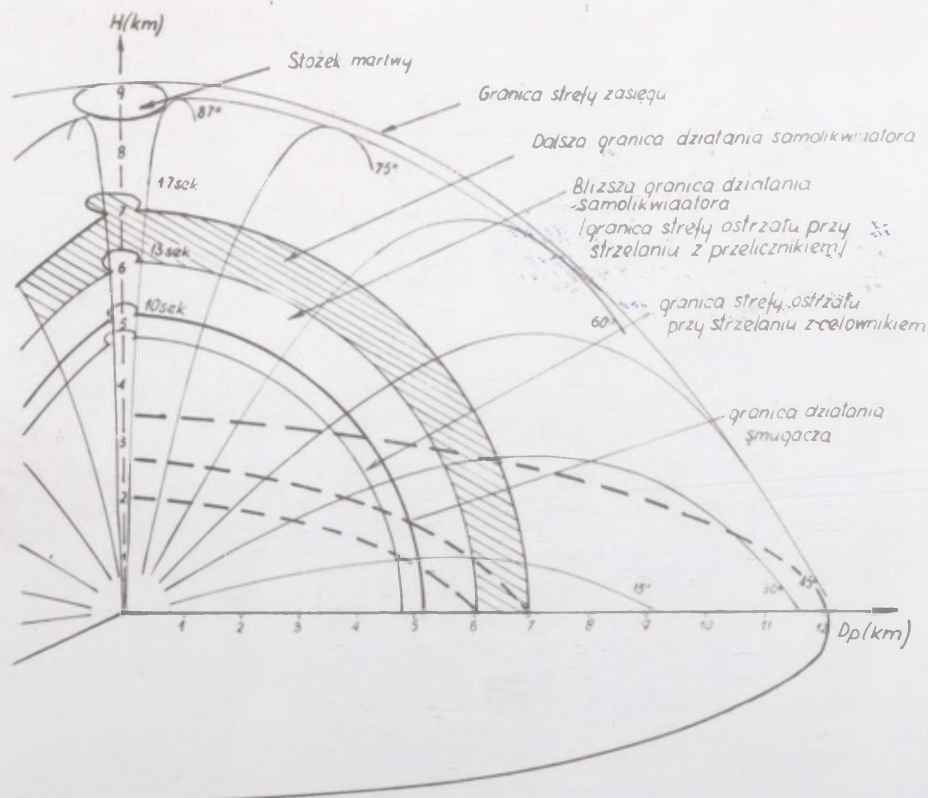
Łączna czas strzelania $\approx 20 \text{ min}$

Pionowe przekroje stref działania środków OPL
(warianty)

- (A) Lotnictwa myśliwskiego i art. plot.
(B) Raket plot i lotnictwa myśliwskiego



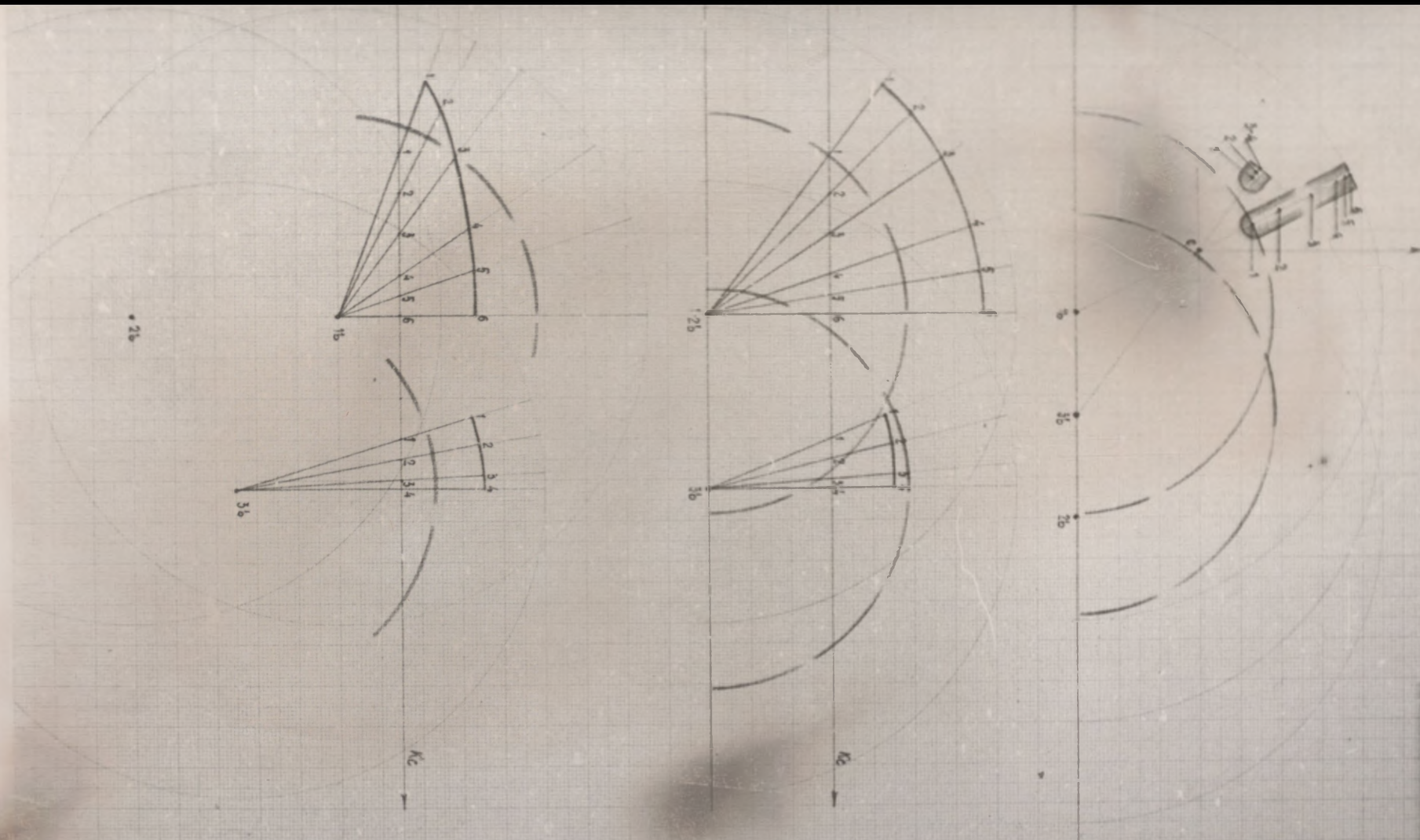
STREFA ZASIEGU 57mm DZIAŁ PLOT



wymiary płaskich stref ostrzału 57mm armat przeciwlotniczych wg tabel balistycznych

Wysokość w m	Promień stożka martw. w m.	Płaska strefa ostrzału w m przy strzelaniu	
		z przelicznikiem	z celownikiem
500	25	5950	4750
1000	50	5900	4650
1500	75	5800	4500
2000	100	5650	4300
2500	125	5500	4100
3000	150	5200	3750
3500	175	4900	3300
4000	200	4550	2650
4500	230	4000	1700
5000	260	3400	—
5500	300	2500	—
6000	340	1050	—

$R_c = 3000 \text{ mm}$
 $R_{\text{długość kół}} = 5000 \text{ mm}$
 R_c - promień okręgu
 $R_{\text{długość kół}}$ - promień kół



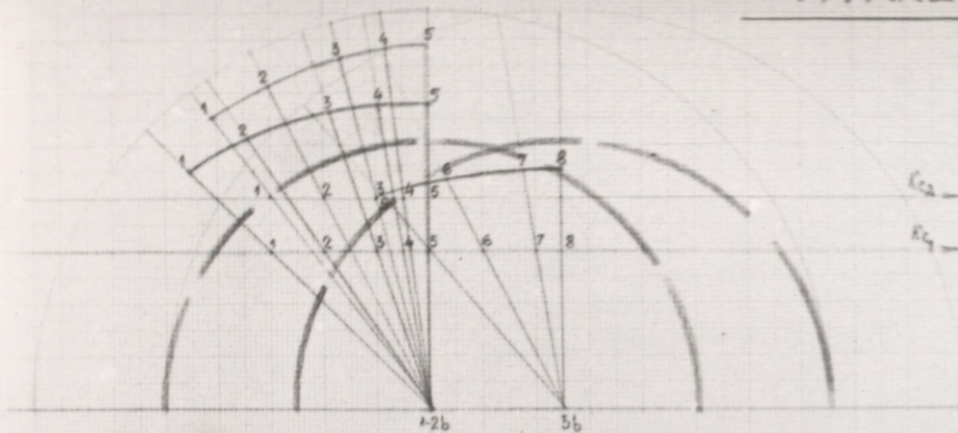
liczba	3m	l_1	l_2	l_3	l_4	l_5	l_6	R_{tot}
3000	1	700	1000	1400	1700	1800	1900	R_{totk}
	3	1700	1900	2000	2000	-	-	
	1	1600	1700	1700	1700	1600	-	R_{totl}
	3	1600	1600	1600	-	-	-	
	1	1500	2000	2700	3400	3600	3700	R_{totH}
	3	1400	1700	1700	1700	-	-	

$V_c = 333 \text{ m/s}$ (1200 km/h)
 Odstępowanie odśrodkowe $\approx 5000 \text{ mm}$
 Średnica koła $\approx 15 \text{ mm}$
 1 kół: 12 kół;
 3 kół: 3 kół;

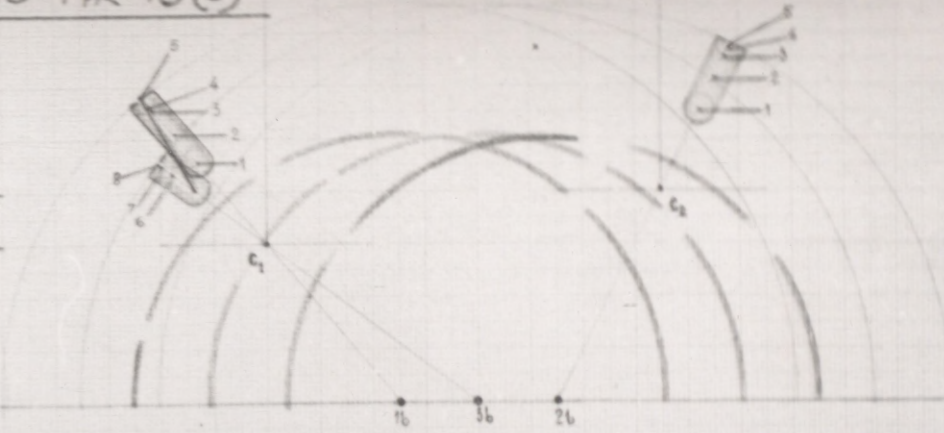
WYKRES NR 10 (D)

WYKRES NR 10(C)

$l_{01} = 5000 \text{ mm}$
 Radiusz koła - 3000
 $l_{02} = 4000 \text{ mm}$ od środka koła



K_{02}
 K_{01}



K_{02}

K_{02}

Wzrost	Wzrost	l_1	l_2	l_3	l_4	l_5	l_6	l_7	l_8	l_9	l_{10}	Pr+
3000	1	1500	1700	2100	2200	2300	-	-	-	-	-	Pr+K
	2	-	-	-	-	1500	1800	2000	2200	-	-	Pr+K
	3	1500	1400	900	1500	-	-	-	-	-	-	Pr+K
	4	-	-	-	-	900	600	800	-	-	-	Pr+K
	5	1500	2100	2600	2800	2800	-	-	-	-	-	Pr+K
	6	-	-	-	-	1800	1300	1500	1100	-	-	Pr+K
4000	1	1500	1100	1200	1300	1300	-	-	-	-	-	Pr+K
	2	1100	1000	700	1300	-	-	-	-	-	-	Pr+K
	3	1500	2100	2500	2700	2800	-	-	-	-	-	Pr+K

$$V_{e,1,2} = 833 \text{ m/s} \quad (1200 \text{ km/h})$$

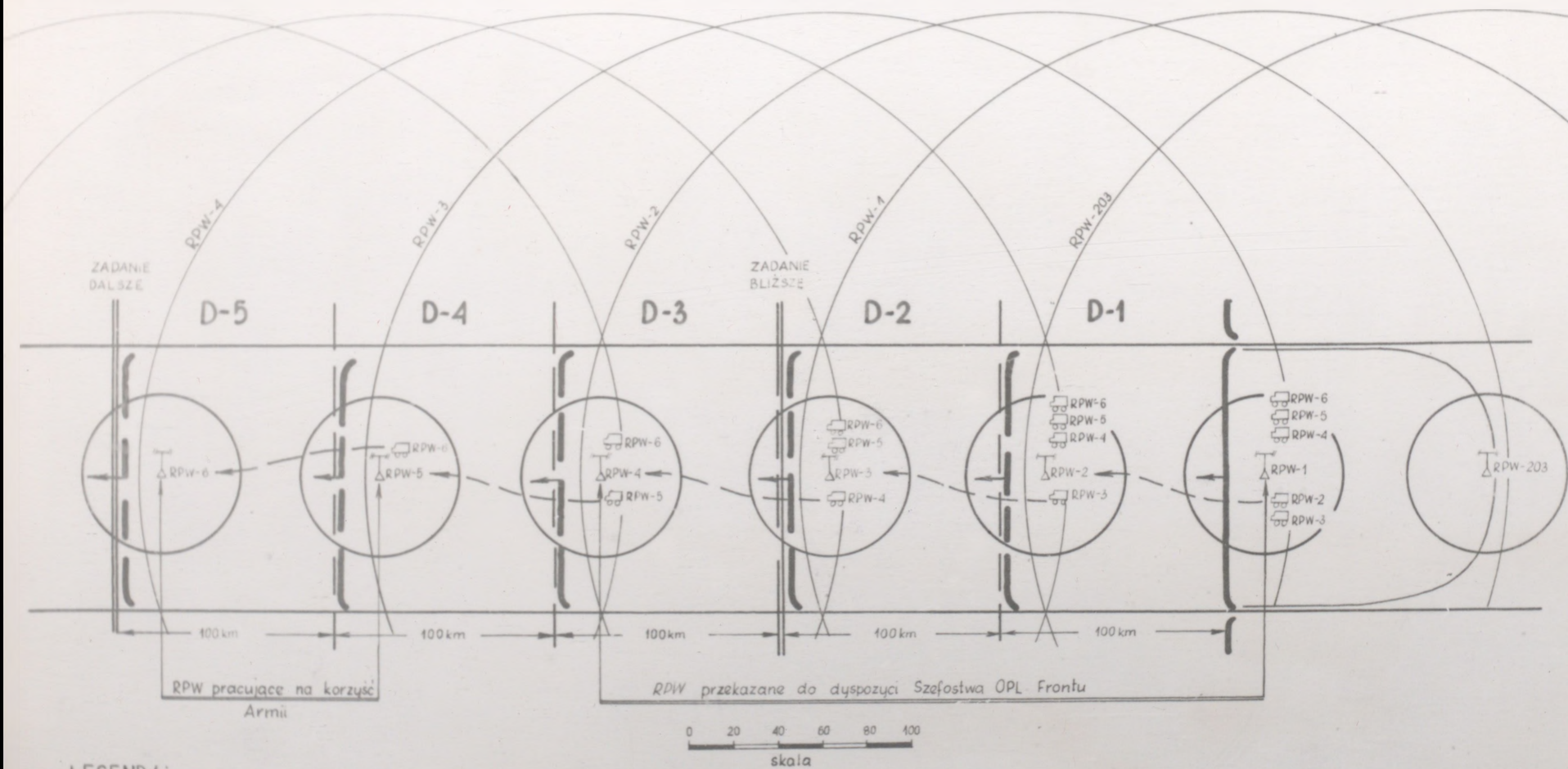
Odstawienie ośrodków drogi: od nr 1 $\approx 5000 \text{ mm}$

od 2 $\approx 3000 \text{ mm}$

Grubość warstwy strukturalnej do nr 1 $\approx 15 \text{ mm}$

od 2 $\approx 9 \text{ mm}$

Schemat wykorzystania wojsk radiotechnicznych armii w operacji zaczepnej (wariant)



LEGENDA:

Możliwość manewru RPW:

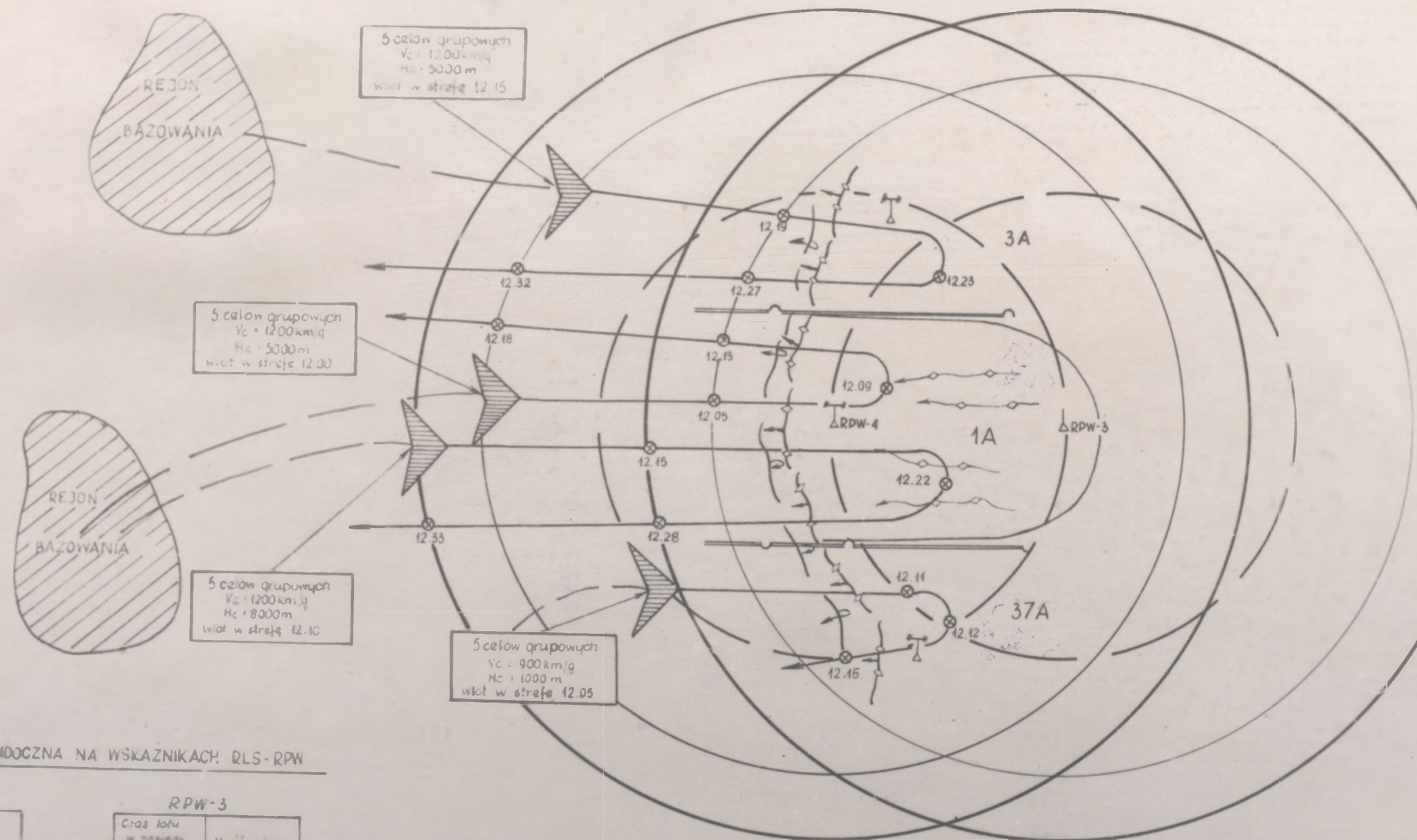
- 1- zwiniecie RPW (P-10) 90 min
- 2- zwiniecie kolumny 20 min
- 3- przemarsz na odległość 250 km (tempo 20 km/godz) 12 30 min
- 4- Postoje w marszu 2 00 min
- 5- Rekonesas stanowiska 30 min
- 6- Rozwinięcie RPW 90 min

ogółem: 18 20 min

Manewr RPW
niemożliwy

- maks. zasięg RPW - 200 km (P-10)
- zasięg RPW na M-500 m.
- - - manewr RPW

Przebieg sytuacji powietrznej w zasięgu RPW (wariant)



ILOŚĆ CELÓW WIDOCZNA NA WSKAZNIKACH RLS-RPW

RPW-4

Czas lotu w zasięgu RPW	Ilość celów
12.00 - 12.05	5
12.05 - 12.10	10
12.10 - 12.15	15
12.15 - 12.20	10
12.20 - 12.25	10
12.25 - 12.30	10
12.30 - 12.35	10

28 minut

RPW-3

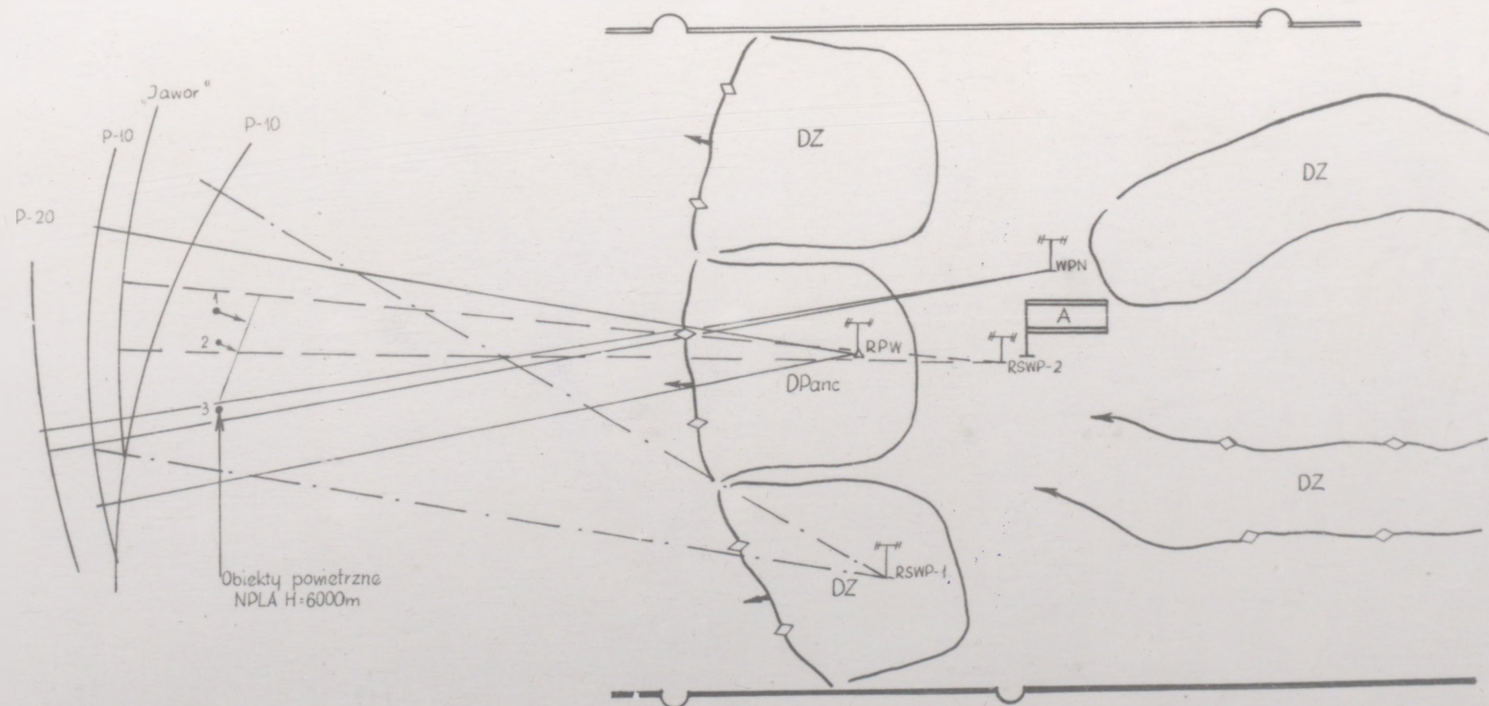
Czas lotu w zasięgu RPW	Ilość celów
12.05 - 12.10	5
12.10 - 12.15	10
12.15 - 12.20	10
12.20 - 12.25	10
12.25 - 12.30	5

45 min

LEGENDA

- strefa zasięgu stacji „Jawor” dla H = 8000m
- strefa zasięgu stacji „Jawor” dla H = 5000m
- strefa zasięgu stacji „Jawor” dla H = 1000m
- ⊗ położenie celu w czasie

Schemat obrazujący zdolność obserwacji obiektów pow. npla przez RLS
w konkretnej sytuacji powietrznej
(Wariant)



LEGENDA

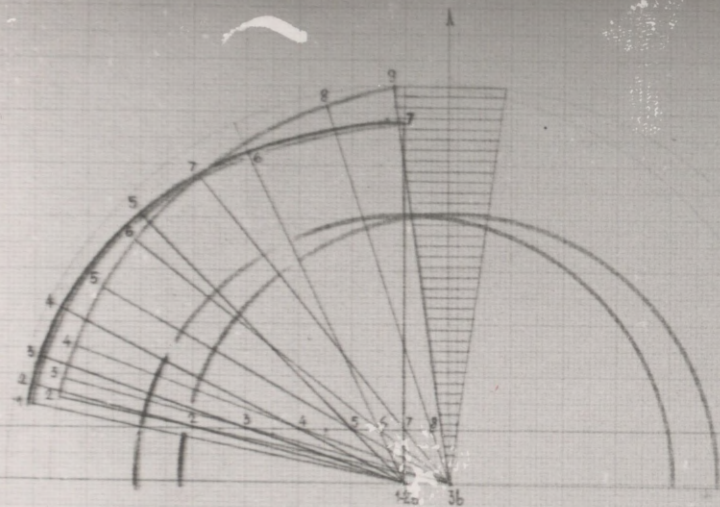
liczba śledzonych obiektów powietrznych npla
przez poszczególne stacje radiolokacyjne

- RPW (P-10) 1 obiekt pow. rozdzielczość kątowna 20°
 RSWP-1 (P-10) 3 obiekty pow. rozdzielczość w D 2500m
 RSWP-2 (Jawor) 2 obiekty pow. rozdzielczość kątowna 4°
 WPN (P-20) 3 obiekty pow. rozdzielczość kątowna $1,3^\circ$

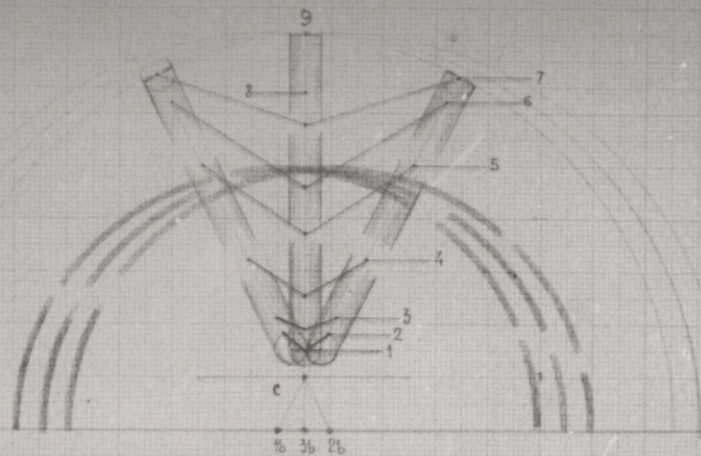
WYKRES NR 1(A)

Wzrostak nr 2 (4)

$V_c = 1000 \text{ km}$
 Odstęp bah - 1 km,
 $K_c = \text{moduł upięty bój}$



K_c



$\frac{1}{2}b$ $\frac{3}{2}b$ $\frac{5}{2}b$

$V_c = 1000$	Bah	l_1	l_2	l_3	l_4	l_5	l_6	l_7	l_8	l_9	l_{10}	moduł u. i. i. i. i.
1000	1	400	400	600	1100	2000	2500	2900	-	-	-	P. i. k.
	2	400	400	600	1100	2000	2500	2900	-	-	-	
	3	-	-	-	-	-	-	-	-	-	-	
	1	1000	3000	3900	4500	4000	2400	-	-	-	-	P. i. k.
	2	1000	3000	3900	4500	4000	2400	-	-	-	-	
	3	-	2500	3400	4200	4700	4600	4000	2000	200	-	
	1	1000	800	1100	2200	4000	4200	-	-	-	-	P. i. k.
	2	1000	800	1100	2200	4000	4200	-	-	-	-	
	3	-	1000	900	1500	2700	3600	4500	5400	6500	-	

$V_c = 833 \text{ m/s}$ (1000 km/h)

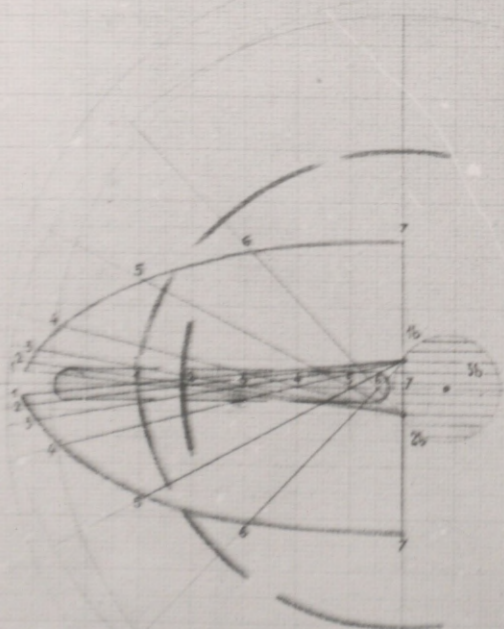
Odstęp od punktu drogi celi $\approx 6000 \text{ m}$

Indeks mas stulania $\approx 18 \text{ sek}$

1 bah: 15 sek

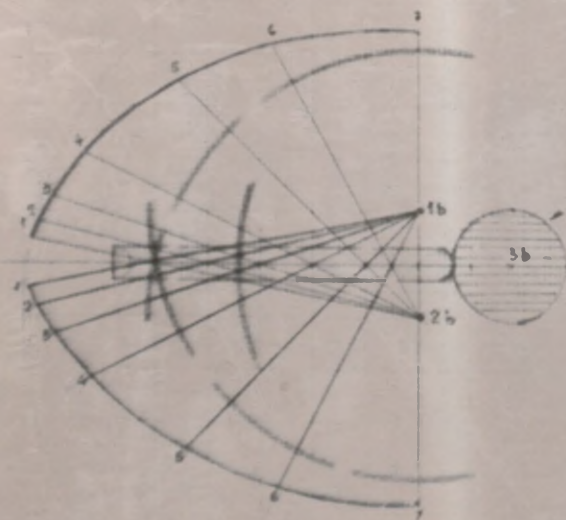
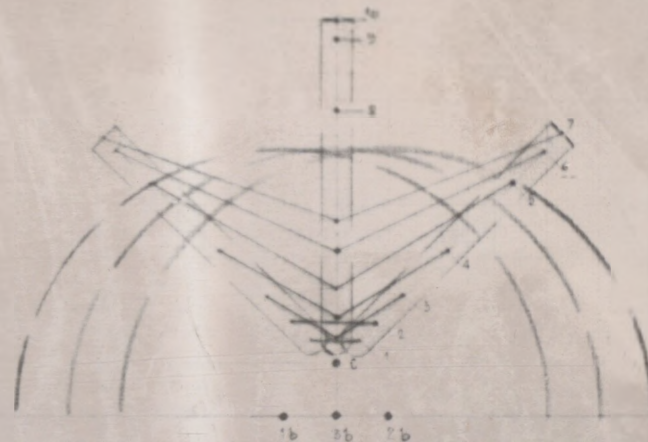
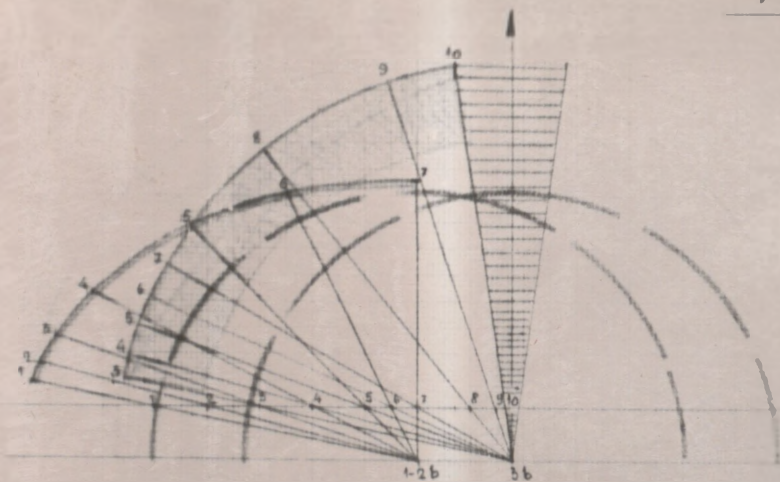
2 bah: 15 sek

3 bah: 15 sek.



K_c

WYKRES NR 1 (B)



metry
stosunek

Wzrost	gł.	l_1	l_2	l_3	l_4	l_5	l_6	l_7	l_8	l_9	l_{10}	Wzrost wzrost
1000	1	100	800	1100	2000	2500	4200	4500	-	-	-	20th
	2	100	800	1100	2100	2600	4300	4600	-	-	-	
	3	-	-	-	-	-	-	-	-	-	-	
	1	2400	3200	3400	4200	3300	2000	-	-	-	-	20th
	2	2400	3200	3400	4300	3300	2000	-	-	-	-	
	3	-	-	2400	3400	4300	4600	4700	4000	2400	1000	
	1	400	800	1300	2100	3400	4000	4500	-	-	-	20th
	2	400	800	1300	2100	3400	4000	4500	-	-	-	
	3	-	-	500	300	2400	2100	2400	4800	600	600	
	3	-	-	500	300	2400	2100	2400	4800	600	600	

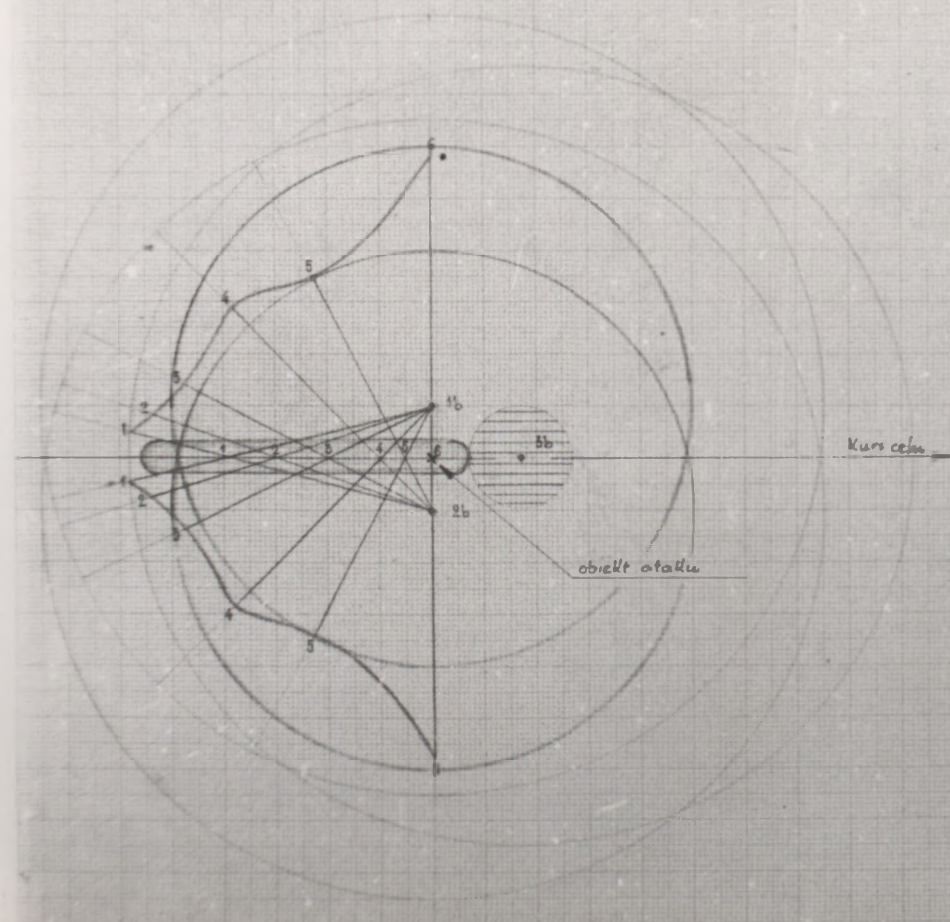
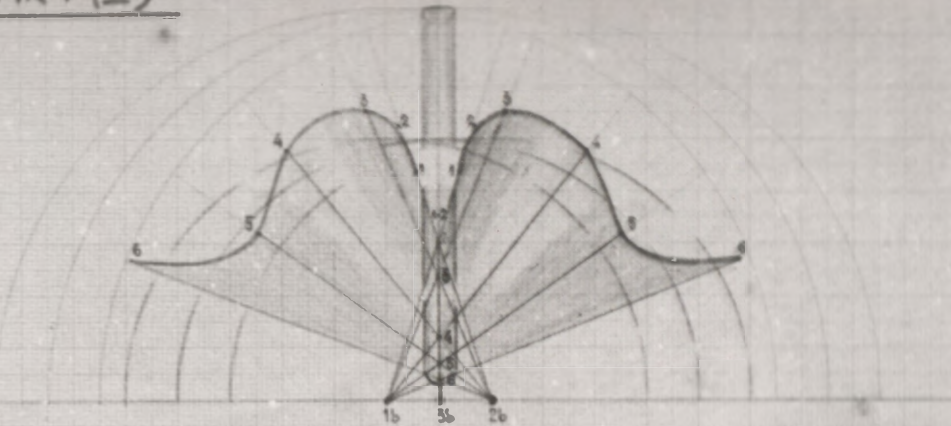
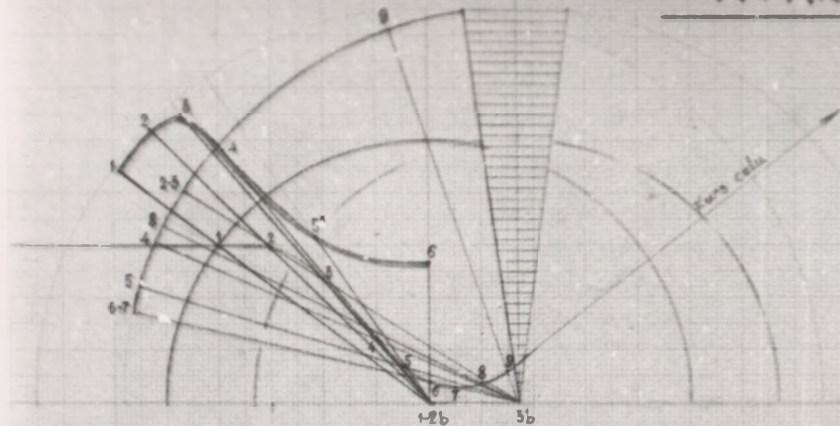


Wzrost = 1000 mm (100 cm)

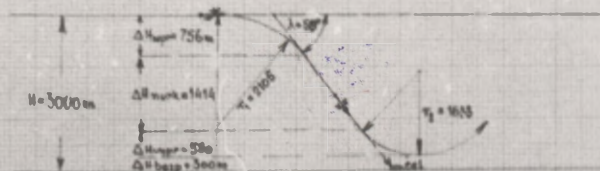
Wzrost wagi = 100 kg (100000 g)

Wzrost i waga = 100 kg (100000 g)

1. *... ..*
 2. *... ..*
 3. *... ..*



Esposizione warandi lotu burkowsko



2. Protein pengikat yang melakukan kerja
misalnya:

$$\tau_1 = \frac{V_{up}^2}{g (\cos \frac{\alpha}{2} - \mu \sin \frac{\alpha}{2})}$$

7- Corroiering yang disebabkan
oleh minyak &

Yago - *Yago* *Yago* *Yago*
g - *g* *g* *g*
h - *h* *h* *h*
n - *n* *n* *n*
ol 1. *ol* *ol* *ol*

Jane: $V_{\text{exp}} = 200 \text{ m/s}$

 $Q = 10 \text{ mol/m}^2$

1. 50

$$a_{ij} = -1$$

$$r_1 = \frac{(240 \frac{m}{s})^2}{10(0,9 + 1)} = \frac{40000 \frac{m^2}{s^2}}{19 \frac{m}{s}} = 2105 \text{ m}$$

2. *Loxia curvirostris* przy odchowaniu w lab.
minkowej:

$$\Delta H_{\text{up}} = \tau_0 (1 - \cos \lambda)$$

$$\Delta L_{\text{upper}} = 2105 \text{ mm} (1 - \cos 50^\circ) = 2105 \text{ mm} (1 - 0.64) = 2105 \text{ mm} (0.36) = 757$$

2. Formuły wyrażające prz. ogólną
i ich użycie:

$$F_2 = \frac{V_{avg}^2}{g(n_{avg} - \cos \frac{1}{2})}$$

$V_{\text{avg}} = V_{\text{top}} + \Delta V$, where ΔV - biggest
difference in velocities between
vertical distance of jumping
the water to

Number - 5 (if not then 4)
 or 2-5 (max)
 4 (max)

June: Vinyr = 200 $\frac{L}{m^2}$, $\frac{1}{2}$ m/s

$$\begin{aligned} \lambda &= 40 \text{ nm} \\ n_1 &= 1 \\ \cos \frac{\lambda}{2} &= 0.9 \end{aligned}$$

$$\tau_2 = \frac{(205 \frac{\text{mm}}{\text{min}})^2}{10 \frac{\text{mm}}{\text{min}} (4.09)} = \frac{70630 \frac{\text{mm}^2}{\text{min}}}{40.9 \frac{\text{mm}}{\text{min}}} = 1727 \text{ min}$$

4. *Ricinus sylvestris* Gray aphelaeum, 1 lbm
in vinegar.

$$\Delta H_{\text{vap}} = T_b \left(1 - \exp \left(-\frac{\Delta H_{\text{vap}}}{RT_b} \right) \right)$$

$$\Delta \text{Height} = 4633(1 - 0.64) = 4633 \cdot 0.36 = \underline{1668 \text{ m}}$$

5. *Polonia, systemi per microscopio*

$$\Delta H_{\text{melt}} = V \cdot \Delta \rho = 200 \frac{\text{J}}{\text{mol}} \cdot 7 \text{ mol} = 1400 \text{ J}$$

1. $t_1 = t_2 + t_3$
 2. - was also 4-5 min
 3. - was much longer
 (1 hour, again 2-3)

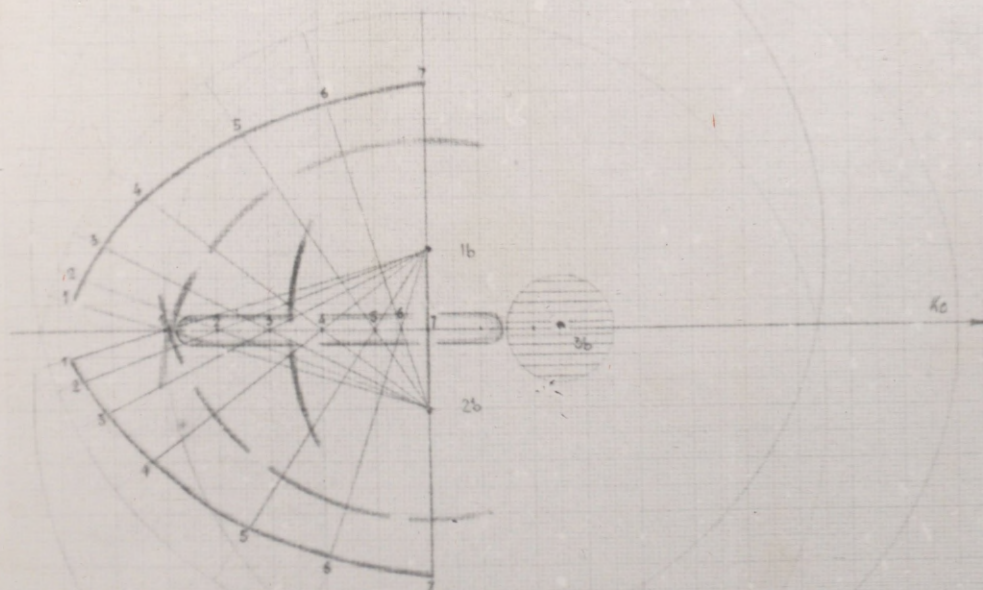
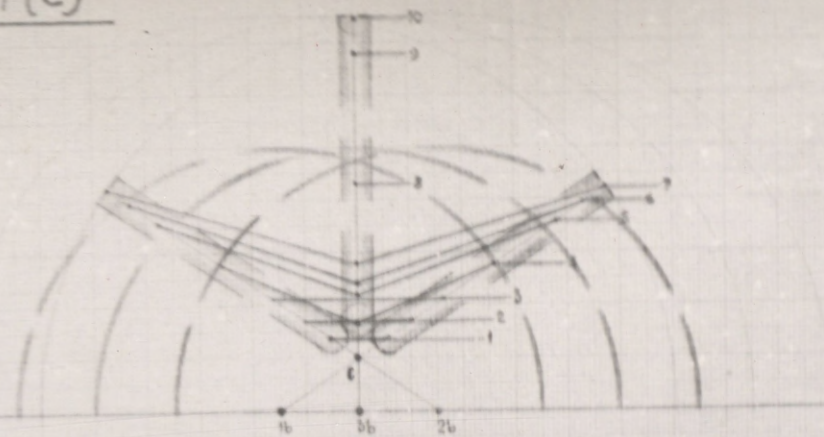
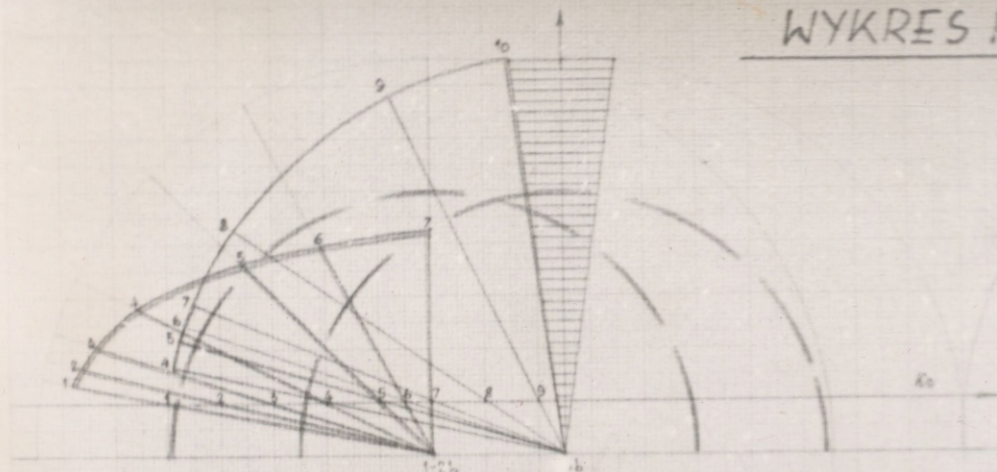
6. Insekten: Eine Anzahl von Insekten
ist mitgebracht.

$$\Delta H_{\text{comb}} = \Delta H_{\text{f}} + \Delta H_{\text{comb}} + \Delta H_{\text{f}} + \Delta H_{\text{comb}} + \Delta H_{\text{f}}$$

$$4 \text{ miles} = 756 \text{ m} + 1400 \text{ m} + 580 \text{ m} + 270 = 3006$$

WYKRES NR 1(C)

Sc. 1000m
Wzrosty lud. 1000m
Liczba lud. 1000m



Wzrost	Bul.	l_1	l_2	l_3	l_4	l_5	l_6	l_7	l_8	l_9	l_{10}	Suma
1000	1	100	1000	1600	2500	3200	4200	4700	-	-	-	10000
	2	100	1000	1600	2500	3200	4200	4700	-	-	-	10000
	3	-	-	-	-	-	-	-	-	-	-	-
	4	1800	2800	3200	3500	3500	4000	-	-	-	-	10000
	5	1800	2800	3200	3500	3500	4000	-	-	-	-	10000
	6	-	-	-	2500	3500	4500	4500	2800	1000	-	10000
	7	400	700	1100	1800	2400	2400	1500	-	-	-	10000
	8	400	700	1100	1800	2400	2400	1500	-	-	-	10000
	9	-	-	-	100	1100	1400	1800	3300	5800	1000	10000
	10	-	-	-	-	-	-	-	-	-	-	-

$V_c = 283 \text{ m/s}$ (1000 km/h)

Odstępowany odzielną drogą, edy. $\approx 7000 \text{ m}$

Ładunek mas strukturalna $\approx 21 \text{ t/m}$