STB-9702 INPUT description

Homemade software STB was written for any aircraft analysis of equilibrium, trimming, stability and maneuverability at low subsonic range. It is based on various reports including NASA CR -1975, NACA Report No.824, different ESDU Reports and other sources. Input for STB software is described below:

Record 1 (format 130 A1):
An arbitrary comment, specific to the version of computing

Record 2 (format 16I5), with 16 control INTEGERs:

1. IPRINT responsible for print of matrices with forces, moments and stability derivatives:
   - =0 no print
   - =1 prints every n-th point (n=NKROK, see INTEGER no 4)
   - =2 prints forces, moments and stability derivatives and selected temporary matrices GUES, FVAL etc. in NONLIG procedure under the condition that IRR (a control INTEGER in NONLIQ subroutine) no is not equal to zero. If something goes wrong the procedure NONLIQ setup automatically IRR=1)
   - =4 prints everything as before and additionally the components of different aircraft design elements in stability derivatives and the coefficients of forces and moments

2. IPRINF controls the output of times to half (or to double) and periods of vibration for all modes of vibration
   - =0 prints times to half (or to double), periods of vibration, damping and frequency coefficients
   - =1 prints damping and frequency coefficients only
   - =2 prints times to half (or to double) and periods of vibration only

3. KLUCZ8 controls the computing and printing of modes of vibration
   - =0 no computing and no printing
   - =1 computes and prints out in “I” points (see IPRINT INTEGER)

4. NKROK controls the print out of matrices with forces and stability derivatives – how many points are skipped between successive printouts

5. IPRFUL controls the printing of solution of the equations of equilibrium, aerodynamic characteristics and stability derivatives as

functions of a selected parameter, for example functions of speed or CG location:

- =0 no print
- =1 prints the solution of the equations of equilibrium both linear and nonlinear, aerodynamic characteristics and stability derivatives
- =2 prints out the stability derivatives only
- =3 prints out the equations of equilibrium and aerodynamic characteristics only (printout of stability derivatives is excluded)
- =4 prints out the solution of the equations of equilibrium, stability derivatives and minimum radius of turn the solution of the equations of equilibrium and eigenvalues
- =5 prints out the solution of the equations of equilibrium and eigenvalues

6. IPRNOT controls the printout of INPUT data
   - =0 no print
   - =1 prints out mass and geometric data
   - =4 prints everything as for IPRNOT=1 and additionally stability margins and control sticks gradients
   - =5 prints everything as for IPRNOT=4 and additionally some auxiliary data for stability derivatives

7. IVS controls the choice of the frame of reference used in the stability analysis
   - =1 computing will be performed in the stability frame of system. Moments of inertia will be transformed from the body frame of reference to the stability frame of reference
   - =2 computing will be performed in the body frame of system. Tensors of stability derivatives will be transformed from the stability frame of reference to the body frame of reference

8. IWYM controls the additional computing of eigenvalues and eigenvectors performed for fully dimensionless and partly dimensionless matrices of state. Partly dimensionless analysis means that lengths speeds and accelerations are dimensionless but time, eigenvalues, time to double, periods of vibration are still dimensional.
   - =1 all computations will be based on dimensional state matrices
   - =2 as for the IWYM=1 case and moreover (if KLUCZ8=1) the state matrices will be printed in the dimensionless form. For such dimensionless form of state matrices the eigenvalues and eigenvectors will be computed

9. ISTER controls the way how the elevator and rudder are kept

=1 elevator and rudder are free
=2 elevator and rudder are fixed

10.IZAK controls the flight-patch
=1 straight-line flight-patch (horizontal, ascending or descending)
=2 horizontal steady turn

11.ISTPLT choice of tailplane
=0 classical tailplane
=1 all-moving tailplane

12.IKACZ choice of configuration
=0 orthodox configuration
=1 Canard configuration
=2 tailless aircraft

13.K6 number of points (steps) the eigenvalues will be computed (equal or less than 61

14.IGEOM selects how the wing parameters CA,S,WYDLE will be defined in the INPUT file
=0 parameters CA,S,WYDLE have to be defined in the INPUT file
=1 parameters CA,S,WYDLE will be computed by STB program and can be left undefined in the INPUT file

15.IVC selects the independent parameter which will be changed for stability analysis
=0 computations will be a function of airspeed
=1 computations will be a function of CG location

16.ITEST controls testing of selected procedures (if something goes wrong)
=0 no test
=1 tests and prints out the results

Record 3 (format 16I5), with 1 control INTEGER:

1.IV controls the increment of speed for stability analysis
=0 speed increment is defined at INPUT file
=1 speed increment is computed in the STB program basing on Maximum and minimum speed values and number of computing points

2.NKACZ – number the pair of flaps located on main wing and body without classic tailplane. Flap deflections must be given. Deflection of the single pair of flaps could be computed by program if NKACZ.LE.5 and NKACZ.GE.0

3.NKLAPY- number of successive pair of flaps the deflection will be computed basing on equation of equilibrium

Record 4 (format 16I5), with 16 control INTEGERs.

These integers control the eigenvalues and eigenvectors computing. Typical values are: 8 8 1 6 0 10 4 1 0 1 0 8 1 0 0 1

Record 5 (format 8G10.4):

1.	AFA0	Angle of attack of the zero lift line (elevator and flaps at zero angle) [deg]
2.	AM	Airplane lift-curve slope, $\partial C_L/\partial\alpha$, [1/deg]
3.	CZMAX	Maximum lift coefficient
4.	DEPSHM	Downwash gradient with respect to α, $\partial\varepsilon/\partial\alpha$, [deg/deg]
5.	DEPSVM	Function of sidewash gradient with respect to sideslip angle, $1+ \partial\varepsilon_v/\partial\beta$,
6.	VHVM	Decrease of the airspeed around horizontal tail, $(V_H/V)^2$
7.	A1M	Tail lift-curve slope, $\partial C_{LT}/\partial\alpha$, [1/deg]
8.	A2M	Tail-lift curve slope with respect to elevator deflection, $\partial C_{LT}/\partial\delta_H$, [1/deg]

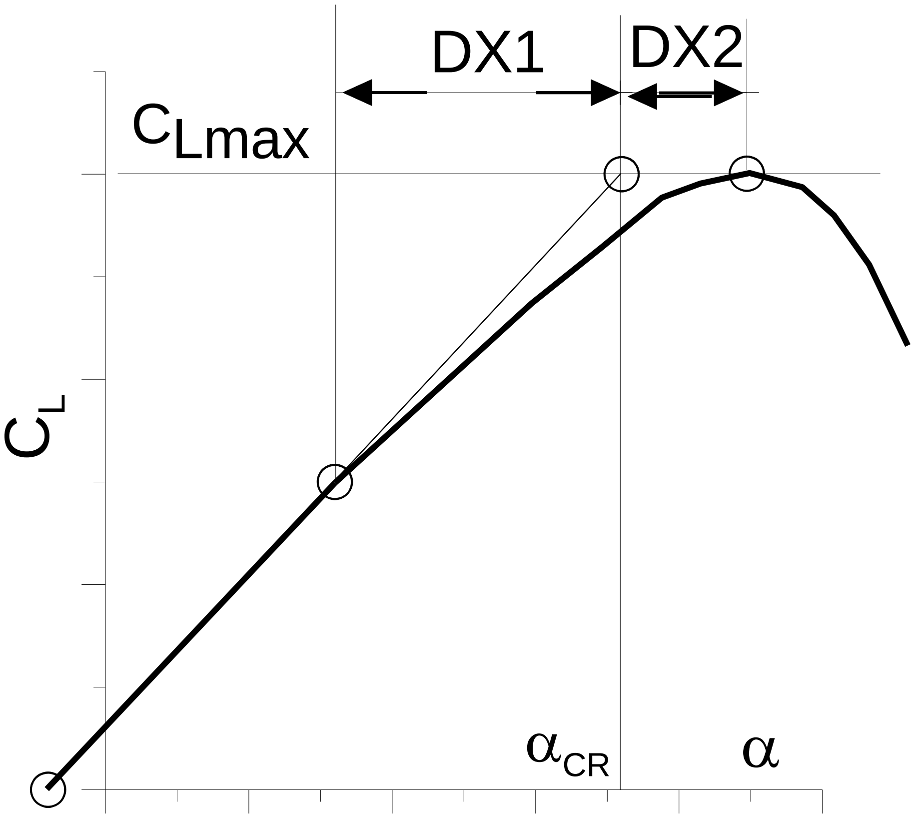
Record 6 (format 8G10.4):

1.	AV1M	Vertical tail lift-curve slope with respect to sideslip angle, $\partial C_Y/\partial\beta$, (negative value, because positive C_Y is directed on right wing, positive β corresponds the airstream coming from right wing and the resultant rudder side force is directed on left wing), [1/deg]
2.	AV2M	Vertical tail lift-curve slope with respect to rudder deflection, $\partial C_Y/\partial\delta_V$, (positive value, because positive C_Y is directed on right wing, positive δ_H means the rudder trailing edge goes on left wing and the resultant rudder side force is directed on the right wing), [1/deg]
3.	CLDLM	control derivative l_ξ , (rolling moment due to aileron deflection; negative value, because if the right aileron is deflected down then rolling moment is negative), [1/deg]
4.	EPS0M	ε_0, downwash when the lift coefficient of the wing-body combination is equal to zero, [deg]

5.	B1M	rate of change of hinge moment coefficient with incident, [1/deg]
6.	B2M	rate of change of hinge moment coefficient with elevator deflection, [1/deg]
7.	BV1M	rate of change of the rudder hinge moment coefficient with sideslip angle, (positive hinge moment vector is directed down (looking from the top the positive hinge moment is directed clockwise), positive sideslip angle β corresponds the airstream coming from right wing) [1/deg]
8.	BV2M	rate of change of the rudder hinge moment coefficient with rudder deflection, (positive hinge moment vector is directed down (looking from the top the positive hinge moment is directed clockwise), positive rudder deflection means that the rudder trailing edge goes on left wing) [1/deg]

Record 7 (format 8G10.4):

1.	CBCZM	gradient of pitching moment coefficient (wing-body combination; horizontal tail is excluded) versus lift coefficient (positive pitching moment results in nose-up; moment pole is located at the quarter of Mean Aerodynamic Chord)
2.	CMBH0	pitching moment coefficient for zero-lift (positive pitching moment results in nose-up; moment pole is located at the quarter of Mean Aerodynamic Chord)
3.	DCZDAZ	Airplane lift-curve slope at supercritical angles of attack (usually negative), $\partial C_L/\partial\alpha$, [1/deg]
4.	CZN	Maximum lift coefficient at negative angles of attack (negative value)
5.	DX1	length of the angle of attack range from the point K when linear range is over to the point L where the horizontal line of maximum lift coefficient intersects the line $C_L= dC_L/d\alpha*(\alpha-\alpha_0)$ (see fig.1), [deg]



6.	DX2	length of the angle of attack range from the point L where the horizontal line of maximum lift coefficient intersects the line $C_L= dC_L/d\alpha*(\alpha-\alpha_0)$ to point M corresponding to α_{CR} (critical angle of attack), [deg]
7.	ACX	coefficient A in the analytical polar drag of the wing-body combination: $C_D = A* C_L^2 + B C_L + C$
8.	BCX	coefficient B in the analytical polar drag of the wing-body combination: $C_D = A* C_L^2 + B C_L + C$

Record 8 (format 8G10.4):

1.	CCX	coefficient C in the analytical polar drag of the wing-body combination: $C_D = A* C_L^2 + B C_L + C$
2.	A3M	tailplane lift-curve slope due to tab placed on tailplane, $\partial C_{LH}/\partial \delta_T$, important for all-moving tail, [1/deg]
3.	CMHDH	tailplane pitching moment-curve slope (around the Mean Aerodynamic Chord of the tailplane) due to tab deflection, placed on tailplane, $\partial C_{MH}/\partial \delta_T$, important for all-moving tail, [1/deg]
4.	B3	hinge moment-curve slope) due to tab deflection, placed on tailplane, $\partial C_{HINGE}/\partial \delta_T$, important for all-moving tail, [1/deg]
5.	DCZDK	lift-curve slope due to flap (either tabflap, or brake flap or elevon) placed on the main wing, $\partial C_L/\partial \delta_F$, (important if control coefficient IKACZ=2), [1/deg] - in the newest

version of STB software (since 2008.03.16) DCZDK is included in the table XKLAPY(5,4) and cannot be defined here

6. DCMDK pitching moment-curve slope due to flap (either tabflap, or brake flap or elevon) placed on the main wing, $\partial C_M/\partial \delta_F$, C_M must be computed with respect to point A; (important if control coefficient IKACZ=2), [1/deg] – in the newest version of STB software (since 2008.03.16) DCMDK DCZDK is included in the table XKLAPY(5,4) and cannot be defined here

Record 9 (format 8G10.4):

1. MTAX3 x coordinate of the moment of thrust vector in the $Ax_Ay_Az_A$ frame of reference (A – corresponds to the quarter point of MAC (Mean Aerodynamic Chord), x_A – axis in the plane of aircraft symmetry directed along the MAC back of the airplane, z_A – axis in the plane of aircraft symmetry directed up of the airplane, perpendicular to the MAC, y_A – is directed on right wing in order to establish the right-oriented frame of system $Ax_Ay_Az_A$). In the case of symmetric flight MTAX3=0, [N*m], Fig.2

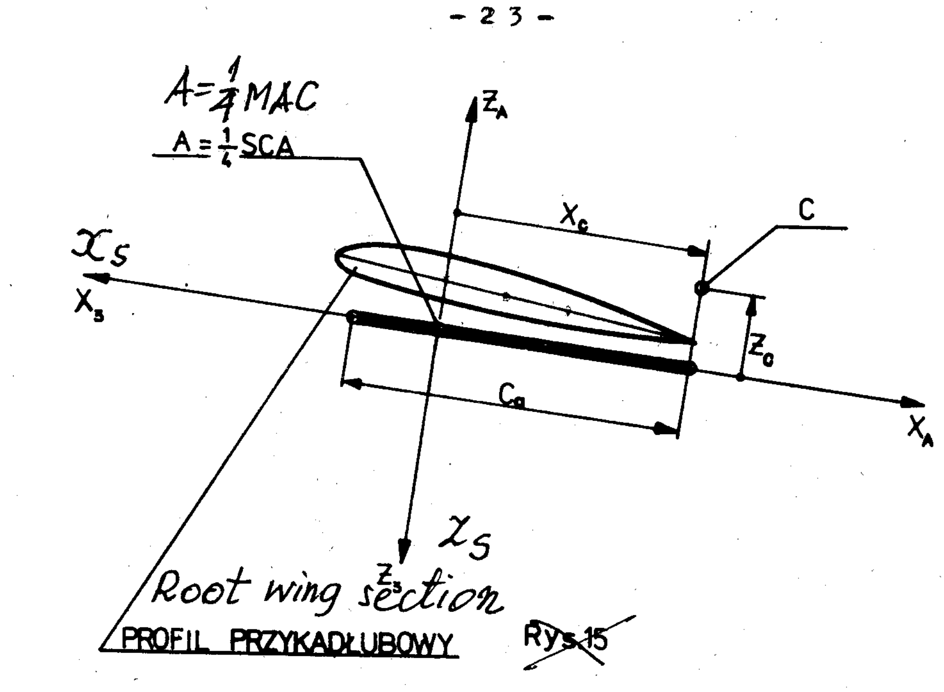


Fig.2

2.	MTAZ3	z coordinate of the moment of thrust vector in the $Ax_Ay_Az_A$ frame of reference (A – corresponds to the quarter point of MAC (Mean Aerodynamic Chord), x_A – axis in the plane of aircraft symmetry directed along the MAC back of the airplane, z_A – axis in the plane of aircraft symmetry directed down of the airplane, perpendicular to the MAC, y_A – is directed on right wing in order to establish the right-oriented frame of system $Ax_Ay_Az_A$). In the case of symmetric thrust MTAZ3=0, [N*m], Fig.2
3.	FIS	angle of thrust setting with respect to MAC, positive if thrust is rotated up, [deg], Fig.3

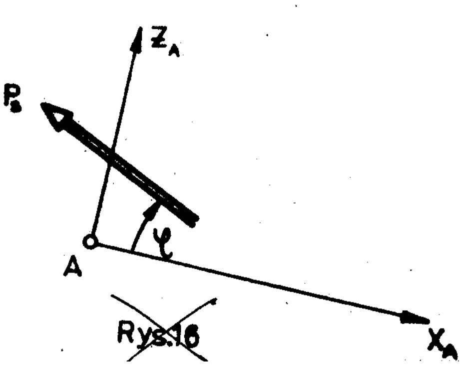


Fig.3

4.	XSA	x coordinate of an arbitrary point placed on the thrust line in the $Ax_Ay_Az_A$ frame of reference (A – corresponds to the quarter point of MAC (Mean Aerodynamic Chord), x_A – axis in the plane of aircraft symmetry directed along the MAC forward of the airplane, z_A – axis in the plane of aircraft symmetry directed down of the airplane, perpendicular to the MAC, y_A – is directed on right wing in order to establish the right-oriented frame of system $Ax_Ay_Az_A$), [m], Fig.4
5.	ZSA	z coordinate of an arbitrary point placed on the thrust line in the $Ax_Ay_Az_A$ frame of reference, [m], Fig.4

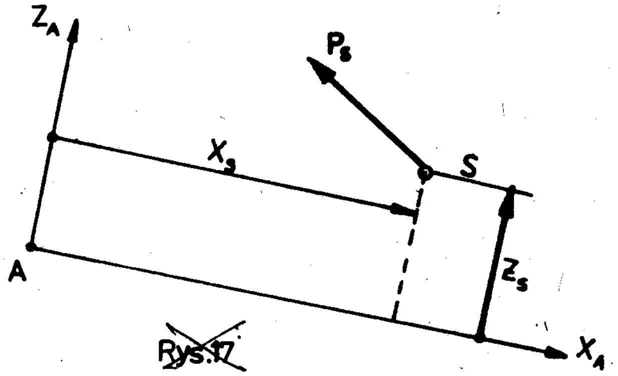


Fig.4

6.	S	gross wing area, [m^2]
7.	WYDLE	wing aspect ratio
8.	B	wing span, [m]

Record 10 (format 8G10.4):

1.	HIX	dihedral angle, [deg], Fig.5

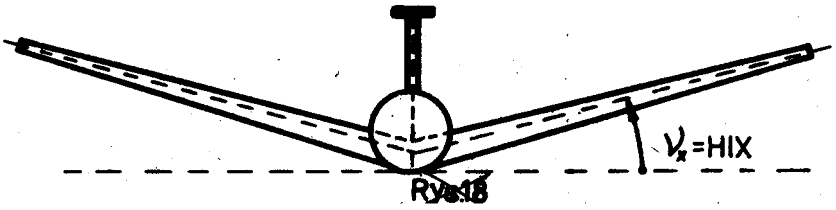


Fig.5

2.	HIZ	main wing quarter chord line speep angle, [deg], Fig.6

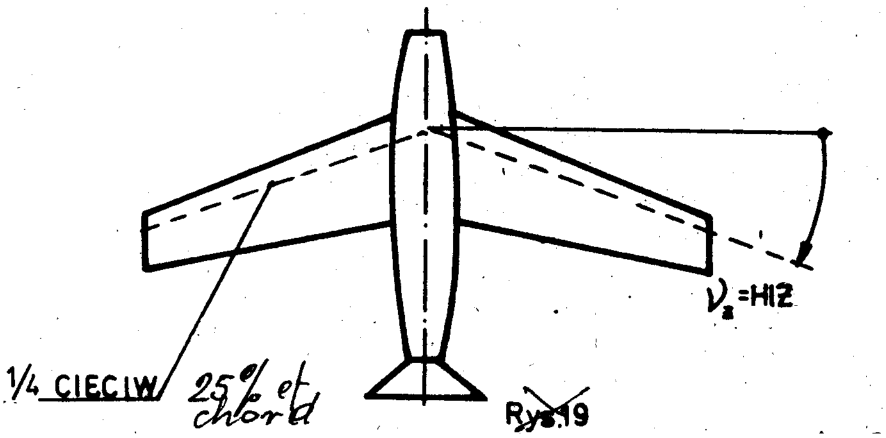


Fig.6

3.	CA	Mean Aerodynamic Chord, [m]
4.	MS	aircraft weight, [kg]
5.	XC0	x coordinate of the aircraft mass centre in the $Nx_Ky_Kz_K$ frame of reference (N – corresponds to the nose of MAC (Mean Aerodynamic Chord), x_K – axis in the plane of aircraft symmetry is directed along the MAC backward of the airplane, z_K – axis in the plane of aircraft symmetry is directed up of the airplane, perpendicular to the MAC, y_K – is directed on right wing in order to establish the right-oriented frame of system $Nx_Ky_Kz_K$), [% of MAC]
6.	YC0	y coordinate of the aircraft mass centre in the $Nx_Ky_Kz_K$ frame of reference (N – corresponds to the nose of MAC (Mean Aerodynamic Chord), x_K – axis in the plane of aircraft symmetry is directed along the MAC backward of the

		airplane, z_K – axis in the plane of aircraft symmetry is directed up of the airplane, perpendicular to the MAC, y_K – is directed on right wing in order to establish the right-oriented frame of system $Nx_Ky_Kz_K$), [% of MAC]
7.	ZC0	z coordinate of the aircraft mass centre in the $Nx_Ky_Kz_K$ frame of reference (N – corresponds to the nose of MAC (Mean Aerodynamic Chord), x_K – axis in the plane of aircraft symmetry is directed along the MAC backward of the airplane, z_K – axis in the plane of aircraft symmetry is directed up of the airplane, perpendicular to the MAC, y_K – is directed on right wing in order to establish the right-oriented frame of system $Nx_Ky_Kz_K$), [% of MAC]
8.	XAH	tail arm along x (x_{AH} coordinate of the tail aerodynamic centre with respect to the A point in the $Ax_Ay_Az_A$ frame of reference (A – corresponds to the quarter point of MAC (Mean Aerodynamic Chord), x_A – axis in the plane of aircraft symmetry directed along the MAC forward of the airplane, z_A – axis in the plane of aircraft symmetry directed down of the airplane, perpendicular to the MAC, y_A – is directed on right wing in order to establish the right-oriented frame of system $Ax_Ay_Az_A$), negative for canard configuration, positive for standard configuration, [m], Fig.7

Record 11 (format 8G10.4):

1.	ZAH	tail arm along z (z_{AH} coordinate of the tail aerodynamic centre with respect to the A point in the $Ax_Ay_Az_A$ frame of reference (A – corresponds to the quarter point of MAC (Mean Aerodynamic Chord), x_A – axis in the plane of aircraft symmetry directed along the MAC forward of the airplane, z_A – axis in the plane of aircraft symmetry directed down of the airplane, perpendicular to the MAC, y_A – is directed on right wing in order to establish the right-oriented frame of system $Ax_Ay_Az_A$), negative if tailplane is below the main wing, positive if tailplane is above the main wing, [m]
2.	SHU	area of tail, [m^2], Fig.7

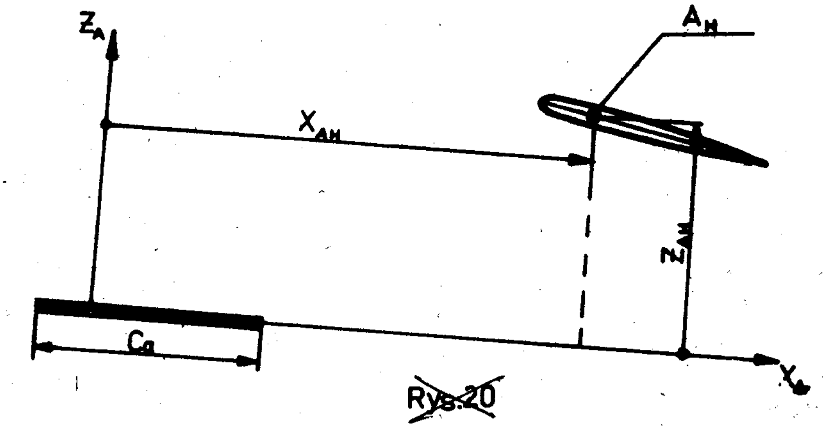


Fig.7

3. ALFAZH angle of the tailplane setting with respect to the main wing MAC, positive if the setting angle increases the tail angle of attack, [deg], Fig.8

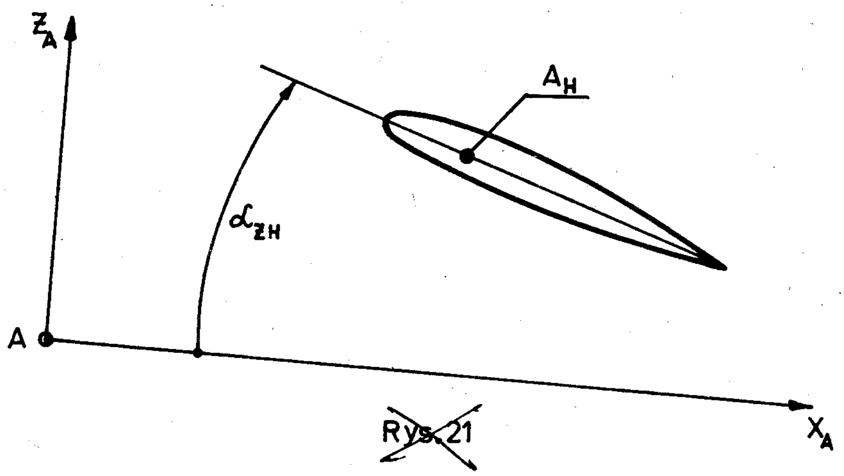


Fig.8

4. XAV vertical stabilizer arm along x (x_{AV} coordinate of the vertical stabilizer aerodynamic centre with respect to the A point in the $Ax_Ay_Az_A$ frame of reference (A – corresponds to the quarter point of MAC (Mean Aerodynamic Chord), x_A – axis in the plane of aircraft symmetry directed along the MAC forward of the airplane, z_A – axis in the plane of aircraft symmetry directed down of the airplane, perpendicular to the MAC, y_A – is directed on right wing in order to establish the right-oriented frame of system $Ax_Ay_Az_A$). Vertical stabilizer aerodynamic centre is located at the point A_V, being the intersection of the quarter line of local chords and the line

going through the 40 % of vertical stabilizer height parallel to the axis Ax_A, [m], Fig.9

5. ZAV vertical stabilizer arm along z (z_{AV} coordinate of the vertical stabilizer aerodynamic centre with respect to the A point in the $Ax_Ay_Az_A$ frame of reference, [m], Fig.9

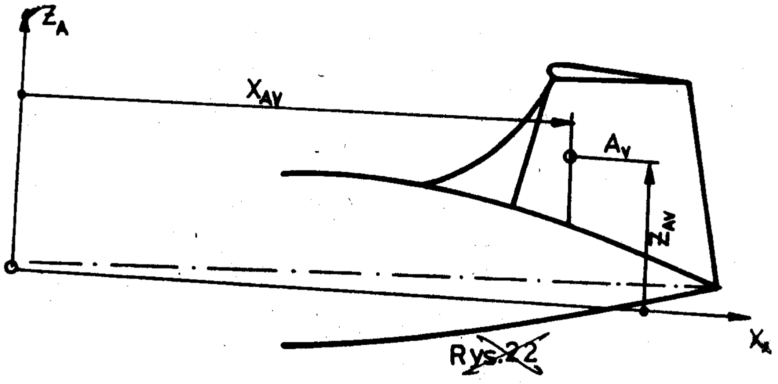


Fig.9

6. SVU area of vertical stabilizer, [m^2]

7. H0CF distance of the wing root chord on the centre line from the centroid of the body section, positive if below the centroid, and negative if above, [m], Fig.10

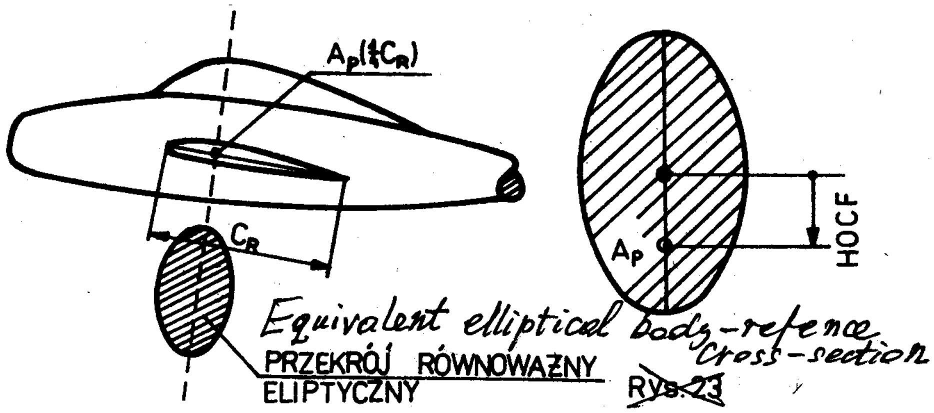


Fig.10

8. WCF average width in plan form of that part of the body which extends from root leading edge to root trailing edge, [m], Fig.11

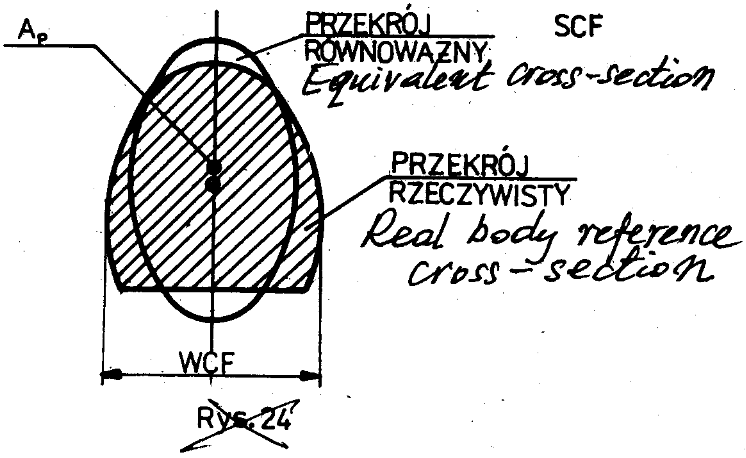


Fig.11

Record 12 (format 8G10.4):

1.	SCF	body reference cross-section in plan form of that part of the body which extends from root leading edge to root trailing edge, [m^2], Fig.14
2.	DXF	body length, [m], Fig.12

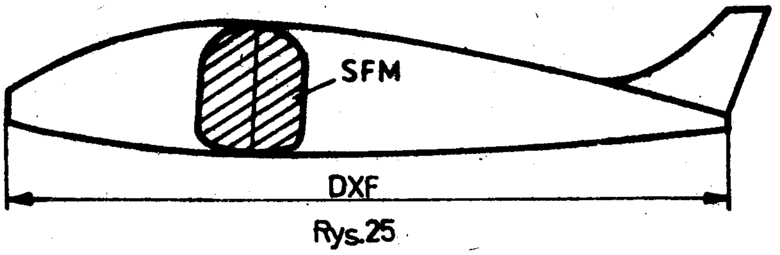


Fig.12

3.	SFM	maximum body cross-section, [m^2]
4.	DXFN	distance of the body nose, forward of position of Mean Aerodynamic Quarter Chord, [m]
5.	SFY	area of of side elevation of body, [m^2], Fig.14
6.	SFYN	area of side elevation of body forward of axis of yaw, [m^2], Fig.13

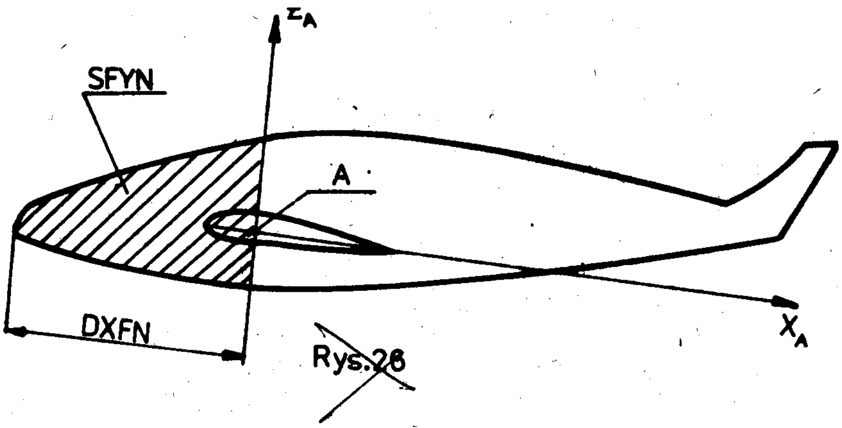


Fig.13

7. HFZ maximum body section height, [m], Fig.14

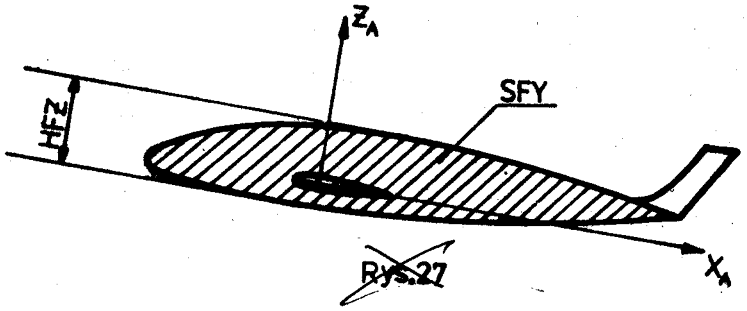


Fig.14

8. FCNVB body shape interference coefficient. The values of n_{VB} stability derivative of a body alone or with a mid wing apper to be about 20% higher, due to absence of interference effects. For bodies of cross section other than circular, the value of n_{VB} stability derivative obtained from the curves should be reduced. This reduction is about 10 % for bodies of elliptic cross-section for which the ratio of width to height is 0.7 nor less. For bodies of rectangular cross-section a reduction of about 25 % should be made for all ratios of width to height less than 1.0. Assume that FCNVB=k_1k_2 where

- $k_1=1$ for body of circular cross-section, either high wing or low wing configuration
- $k_2=1$ if engines are hidden in the body

or

1. $k_1=1.25$ for body of circular cross-section, and med low wing configuration
2. $k_1=0.9$ for body of elliptic cross-section for which width to height ratio is less than 0.7. For such a case the wing-body arrangement is irrelevant.

3. $k_1=0.75$ for body of rectangular cross-section if its width to height ratio is less than unity. There is no data if the width to height ratio is higher than unity
4. $k_2=0.6$ if two small nacelles are place below the wing.
5. There are no data for all other arrangements.

Record 13 (format 8G10.4):

1. A1FR body alone lift-slope curve (in reference to the top elevation of body area, i.e. area projected over the xy plane), [1/rd]
   = 0.0525 for body of circular cross-section
   = 0.1243 for body of rectangular cross-section
2. SF23 a body reference area defined as follows: $SF23=V^{2/3}$, where V is the body volume, [m^2]
3. BV span of the vertical stabilizer, Fig.15
4. DFV average body diameter in the vicinity of vertical stabilizer, [m], Fig.15

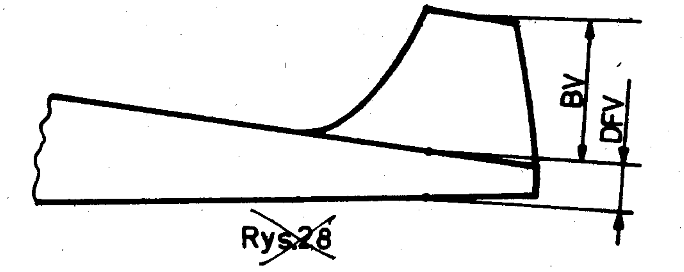


Fig.15

5. PSY thrust component on the left wing (usually equal to zero, non zero if thrust is asymmetric), [N]
6. BL aileron span (distance from the right aileron mid point to the left aileron mid point), [m], Fig.16
7. WYDLLL an equivalent aileron aspect ratio defined as

$$A_L = \frac{d_L^2}{1/2 * S_L} ,$$

where S_L is the area of that part of the right wing, which includes the right aileron, and d_L is the ailerons span, Fig.16

8. SL area of that part of the right (or left) wing, which includes the right (or left) aileron, Fig.16

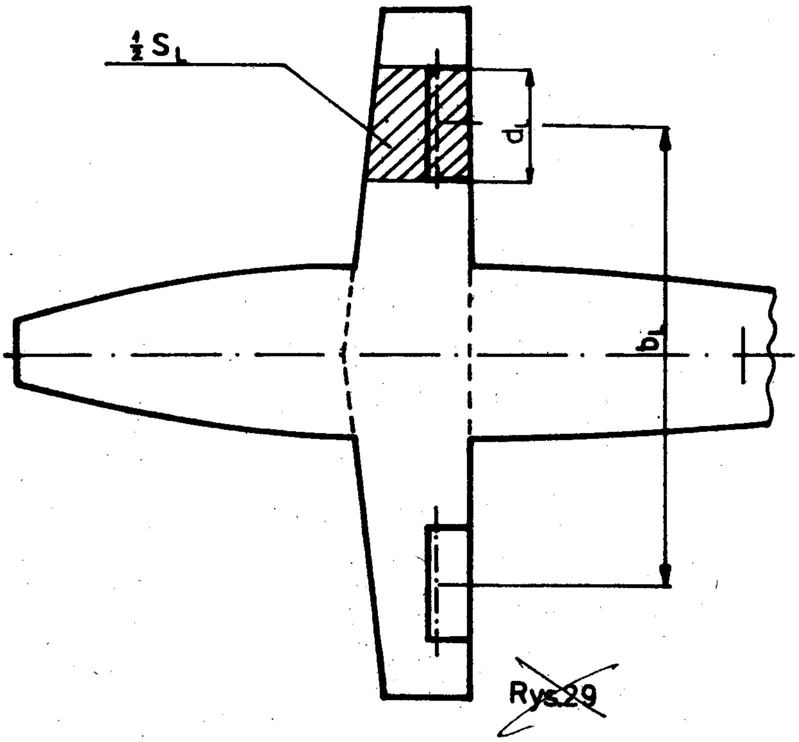


Fig.16

Record 14 (format 8G10.4):

1.	ALFA0H	angle of attack of zero lift line for horizontal tailplane, [deg], Fig.17

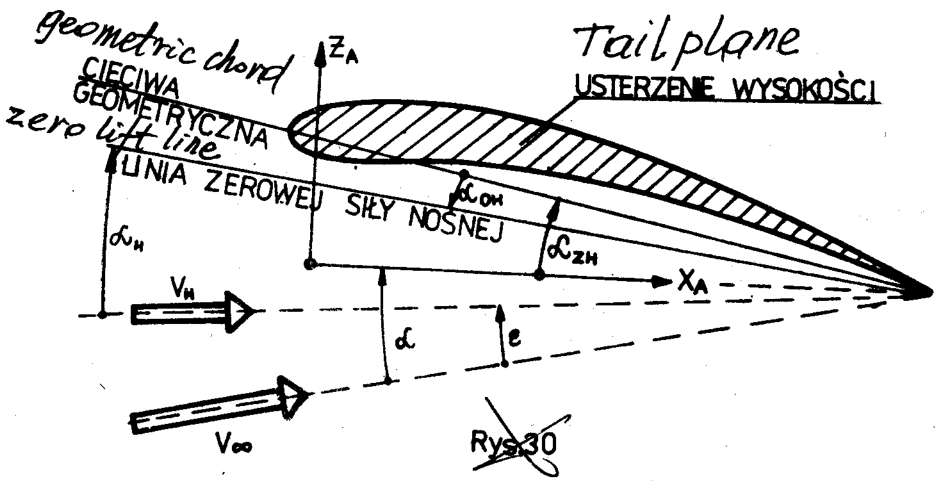


Fig.17

2.	AK2	main wing section lift-curve slope with respect to flap deflection, $\partial C_L/\partial \delta_K$, [1/deg]
3.	BK	flap span (distance between external end points of the flaps), [m], Fig.18

4.	BKR	flap span (distance between internal end points of the flaps), [m], Fig.18

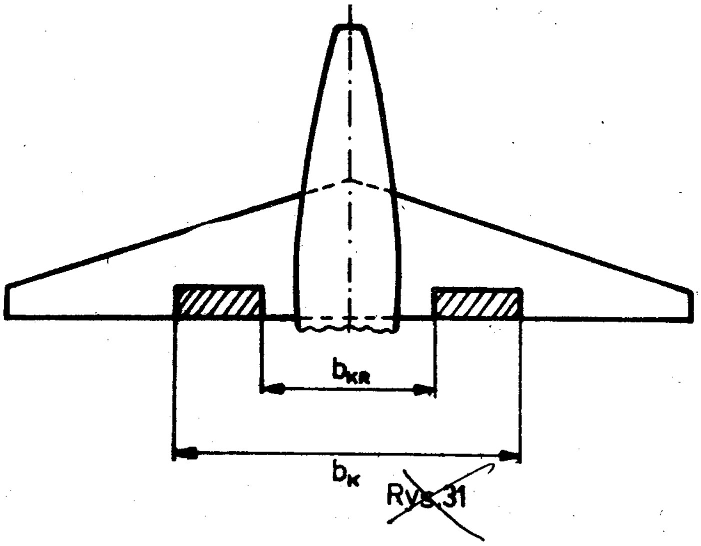


Fig.18

5.	CX0H	minimum drag coefficient of tailplane (for C_{LH}=0), referenced to the tailplane area
6.	CR	main wing root chord, [m], Fig.19
7.	CT	main wing tip chord, [m], Fig.19

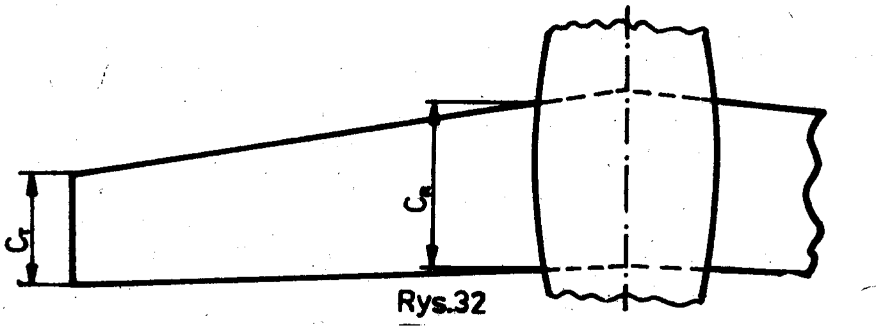


Fig.19

8.	DCX0	increment of the main wing drag coefficient due to flaps deflection at C_L=0, Fig.20

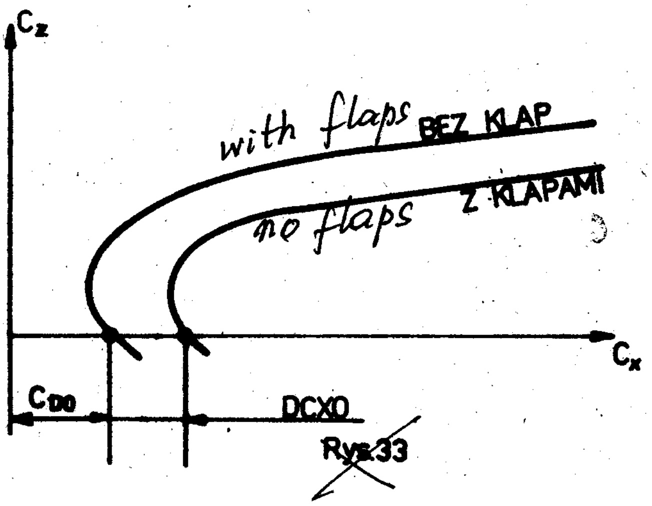


Fig.20

Record 15 (format 8G10.4):

1. HIEPS geometric wing twisting, $\varepsilon=\varepsilon_R - \varepsilon_T$, [deg], Fig.21

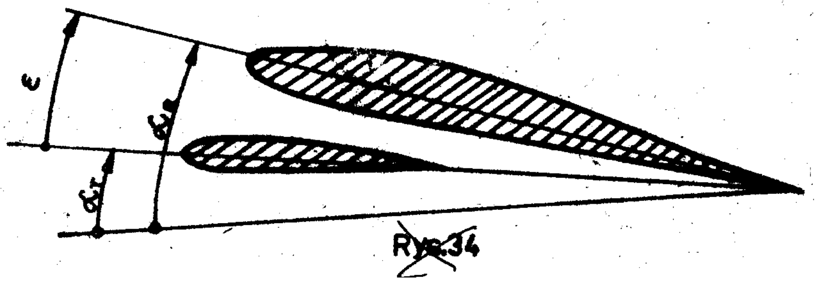


Fig.21

2. WYDLHEE effective aspect ratio of tailplane
3. WYDLEE effective aspect ratio of main wing
4. XR x coordinate of the point R in the $Ax_Ay_Az_A$ frame of reference (negative for backswept wing). Point R is the intersection of the quarter chord line and the aircraft vertical plane of symmetry, [m], Fig.22

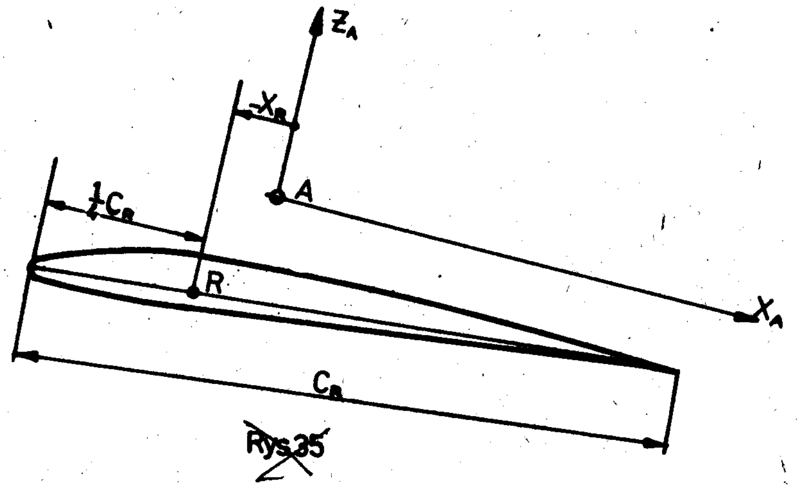


Fig.22

5. DK	current flap deflection, [deg]
6. JX	moment of inertia about Ax_A axis for the whole aircraft, [kg*m^2]
7. JY	moment of inertia about Ay_A axis for the whole aircraft, [kg*m^2]
8. JZ	moment of inertia about Az_A axis for the whole aircraft, [kg*m^2]

Record 16 (format 8G10.4):

1. JXY	moment of deviation about Ax_Ay_A axes for the whole aircraft, [kg*m^2]
2. JXZ	moment of deviation about Ax_Az_A axes for the whole aircraft, [kg*m^2]
3. JYZ	moment of deviation about Ay_Az_A axes for the whole aircraft, [kg*m^2]
4. VWP	horizontal gust value, positive if from rear of the aircraft nose, [m/s], Fig.23 (positive gust – from rear to nose - increases angle of attack and creates a risk of stall)
5. VWB	horizontal side gust value, positive if from left wing, [m/s], Fig.23

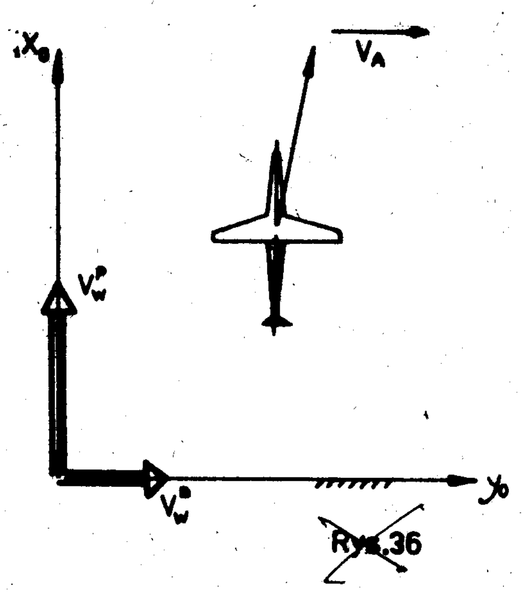


Fig.23

6. RO	air density, [kg/m^3]
7. VD	speed of sound, dependent on the altitude and temperature, [m/s]
8. BETAA	sideslip angle, positive if aircraft moves on the right wing, [deg], Fig.37

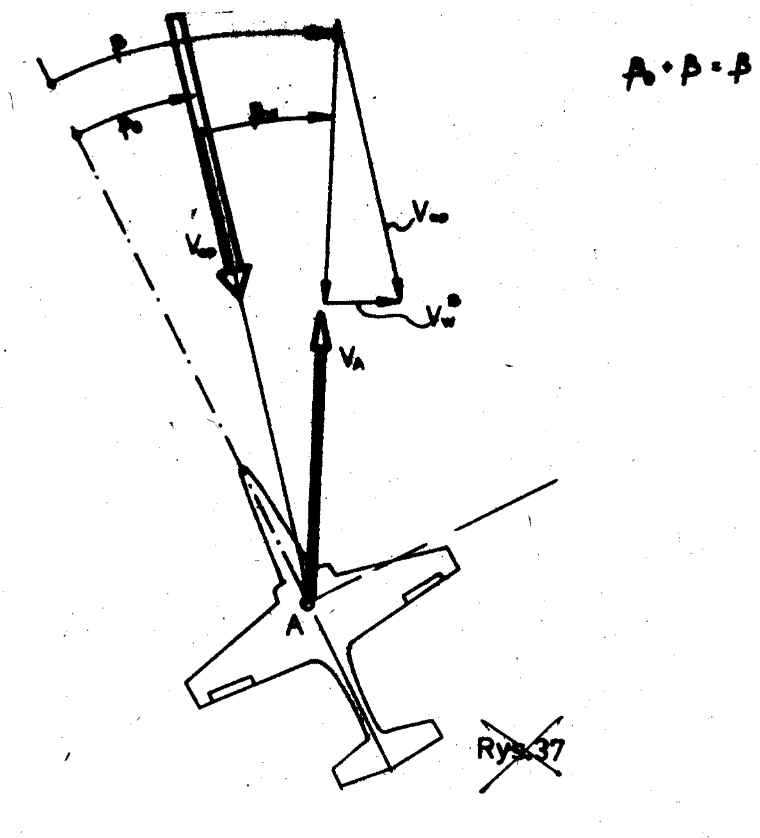


Fig.24

Record 17 (format 8G10.4):

1. TETAT flight patch angle, [deg], Fig.25

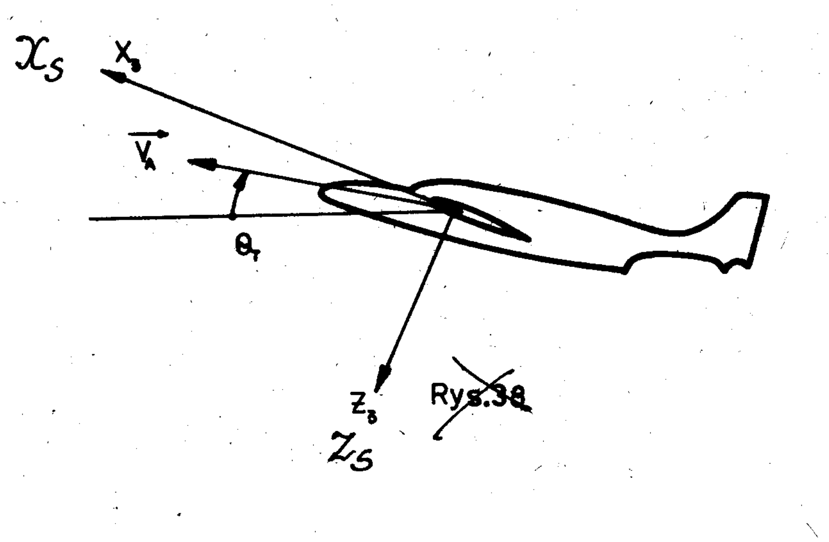


Fig.25

2. VK maximum true airspeed in level flight (must be less than speed of sound), [m/s]
3. CHS average elevator chord (after hinge axis), [m], Fig.26
4. SHS elevator area (after hinge axis), [m^2], Fig.26

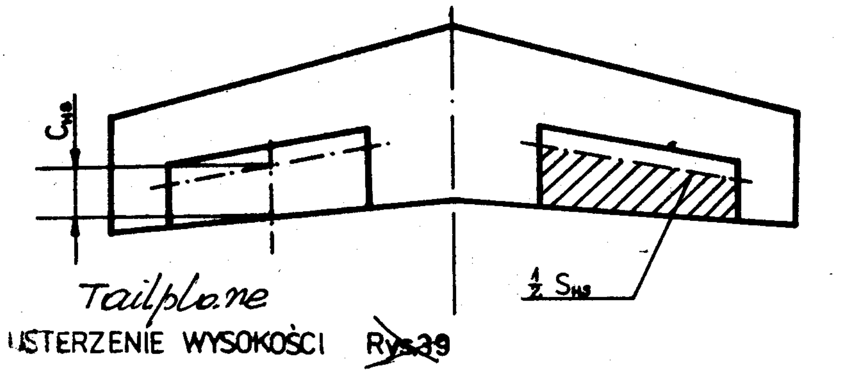


Fig.26

5. FG δ_H /δ_{CS} ratio (elevator deflection to the handle of control stick deflection), [rd/m]; δ_H - positive, if TE of elevator goes down; δ_{CS} (deflection of the control stick [m]) - positive, if head of the control stick goes forward, i.e. if pilot pushes it outword;
6. CVX0 minimum drag coefficient of the vertical stabilizer (for C_{LV}=0), referenced to the vertical stabilizer area

7.	WYDLVEE	effective aspect ratio of vertical stabilizer, Fig.27

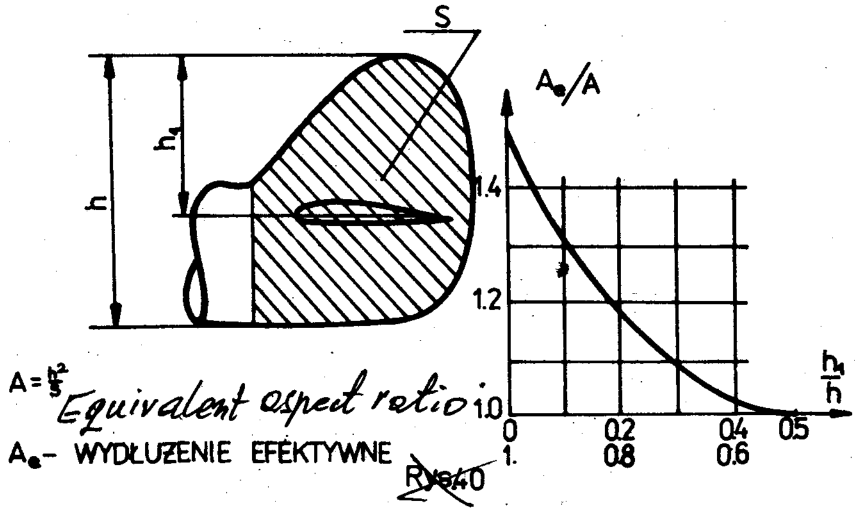


Fig.27

8.	R	radius of turn (put zero when in straight level flight), [m]

Record 18 (format 8G10.4):

1.	V0	stall speed, V_{S1}, [m/s]
2.	DV	step of speed. The maximum step's number is 60 and the following relation has to be held: V=V0+DV*60 < VD, [m/s]
3.	XC00	an initial value of the centre of mass location (in meters, measured with respect to the origin located at 25% MAC). It is important if program calculate the stability versus the centre of mass location, and not versus the speed, [m]
4.	DXC	step of the mass centre location (in meters, measured with respect to the origin located at 25% MAC). It is important if program calculate the stability versus the centre of mass location, and not versus the speed, [m]
5.	XMGH	mass component of hinge moment of elevator, positive if elevator is nose-heavy. Put zero, if elevator is fully balanced, [N*m]
6.	SZT	stiffness coefficient in the control system of elevator, important if elevator is endowed with trimmer, [N*m/deg]
7.	FCZM	margin of lift coefficient in turn flight (equal to the ratio C_{Lmax}/C_L)
8.	XNMAX	maximum load ratio, equal to L/W-1

Record 19 (format 8G10.4):

1.	DVMAX	maximum rudder deflection, positive if left looking from above of the airplane, [deg]
2.	DLMAX	maximum aileron deflection, positive if down, [deg]

3.	XC1	forward position of the aircraft mass centre measured in the percent of MAC with respect to the MAC leading edge (for example 15% or 30 % of MAC). It will be used to compute the control stick force. [%], Fig.28
4.	XC2	nominal (medium) position of the aircraft mass centre measured in the percent of MAC with respect to the MAC leading edge (for example 15% or 30 % of MAC). It will be used to compute the control stick force. [%],Fig.28
5.	XC3	backward position of the aircraft mass centre measured in the percent of MAC with respect to the MAC leading edge (for example 15% or 30 % of MAC). It will be used to compute the control stick force. [%],Fig.28

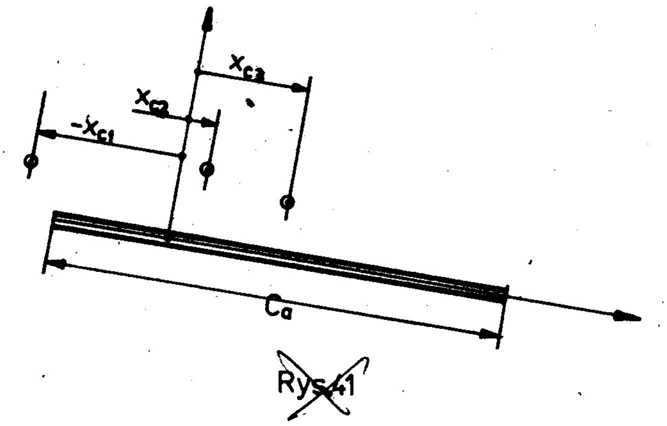


Fig.41

6.	AP	main wing section lift-curve slope, [1/deg]
7.	XMAXD	maximum load factor equal to L/W-1 at point D over the load envelope
8.	VDD	maximum true airspeed at point D over the load envelope, [m/s]

Record 20 (format 8G10.4):

1.	XKKL	$k=\Delta\delta_T/\Delta\delta_H$ ratio (tab deflection to the elevator deflection), [deg/deg]
2.	XH	distance of the hinge axis behind the tailplane aerodynamic centre, positive if the hinge axis is located behind aerodynamic centre, important for all-moving tailplane, [m]
3.	CHU	mean geometric chord of tailplane, [m]
4.	WYDLEH	geometric aspect ratio of the tailplane
5.	HIZH	sweep angle of the quarter chord line of the tailplane, [deg]
6.	TAPERH	taper ratio of the tailplane (equal to C_{HT}/C_{HR})
7.	APH	tailplane wing section lift-curve slope, [1/deg]
8.	XIXH	tailplane dihedral angle, [deg]

Record 21 (format 8G10.4):

1.	BH	span of the tailplane, [m]
2.	BKH	outer elevator span (distance between external end points of the elevator), [m]
3.	HIEPSH	geometric tailplane twisting, $\varepsilon_H = \varepsilon_{HR} - \varepsilon_{HT}$, [deg]
4.	BKRH	inner elevator span (distance between internal end points of the elevator), [m]
5.	AK2H	tailplane wing section lift-curve slope with respect to elevator deflection, $\partial C_{LH}/\partial \delta_H$, [1/deg]
6.	CVS	average rudder chord (after hinge axis), [m]
7.	SVS	rudder area (after hinge axis), [m^2]
8.	FGV	δ_V / δ_P ratio (rudder deflection to the pedal deflection), [rd/m]

Record 22 (format 8G10.4):

1.	XJTP	moment of inertia of rotating engine turbine + propeller, [kg*m^2]
2.	XOMEGA	rotating velocity of propeller, [rev/min]

Records 23 –27 (format 4G10.5):
The Table XKLAPY(5,4) including in successive lines the data of pair of wing or body flaps. Any line has data for one pair of flaps only and these are columns since 1 to 4:

1. No of pair of flaps
2. Deflection of flaps in deg
3. Curve slope of lift coefficient versus flaps deflection related to wing area of main wing (see DCZDK given in record no 8)
4. Slope curve of pitching moment versus flaps deflection related to wing area of main wing (see DCZDK given in record no 8)

```
READ (1,222)((XKLAPY(I,J), J=1,4),I=1,5)
  222 FORMAT(4G10.5)
```

Record 28 (format 20A2):
An alphanumeric string, describing a parameter for which eigenvalues and eigenvectors are computed (columns 1-10) and defining the CG location, for which stability margin and controllability parameters are computed (columns11-40). An example is placed below:

1 column	11 column	21 column	31 column
Speed V	15 %	19 %	24 %

An example of INPUT file for STB software:

```
I-23  XJTP=0  XOMEGA=0
    4    0    1   20    4    4    2    1    2    1    0    0   60    0    0    0
    0    5    1
    8    8    1    6    0   10    4    1    0    1    0    8    1    0    0    1
-4.       0.095     1.4       0.2       1.        0.9       0.058     0.037
-0.052    0.0168    -0.0031   1.0       -0.001    -0.001    0.001     -0.001
0.096     -0.130    0.095     -1.2      2.        2.        0.044     -0.013
0.028     0.1       0.1       0.1       0.0295    0.
0.        0.        0.        0.        0.32      10.       8.1       9.
4.5       0.        1.14      1059.     35.       0.        25.       3.76
0.27      2.08      0.        3.76      0.92      1.56      0.366     1.18
1.23      6.59      1.23      2.29      4.38      1.52      1.33      0.95
0.060     1.938     1.374     0.223     0.        7.06      7.18      2.95
0.        0.01000   5.5       1.2       0.01      1.43      0.87      0.01
0.        3.11      7.29      -.039               678.      1499.00   2116.
0.        0.        0.        0.        0.        1.223     340.3     0.
0.        100.      0.220     0.712     2.5       0.01      2.38      0.
35.       1.        -0.057    0.003     0.        0         1.1       4.0
20.       20.       20.       25.       30.       0.12      4.2       105.
1.        0.00      0.6615    3.66      0.        0.625     0.1       0.
3.2       3.20      0.        0.0       0.087     0.220     0.712     2.5
0.        0.
1.        0.        0.037     -0.01
2.        0.        0.00948   -0.00248
3.        0.        0.00616   -0.00228
4.        0.        0.00292   -0.00144
5.        0.        0.        0.0
PREDKOSC V=20%      =25 %     =35 %
 HARVE (ESDU) TEST COOPERA-HARPERA 1   STERY ZABLOKOWANE                                                            VA=
 HARVE (ESDU) TEST COOPERA-HARPERA 1   STERY ZABLOKOWANE                                                            VA=
 RO      MS      XC      YC      ZC      TETAT   BETA    XAH     SHU     XAV     SVU     HIX     HIZ     B       CT/CR   WYDLE
 POLOZENIE SRODKA MASY SAMOLOTU= X PROCENT SCA
 ALFA0     AM        CZMAXM    DEPSHM    DEPSVM    VHV       A1M       A2M       AV1M      AV2M      CLDLM     EPSOM     B1M
 B2M       BV1M      BV2M      CBCZM     CMBH0     DCZDAZ    CZN       DX1       DX2       ACX       BCX       CCX       A3M
 CMHDK     B3        dczdk     dcmdk     dczda     dcmda
 MTAX3     MTAZ3     FIZ       XSA       ZSA       S         WYDLE     B         HIX       HIZ       CA        MS        XC0
 YC0       ZC0       XAH       ZAH       SHU       ALFAZH    XAV       ZAV       SVU       H0CF      WCF       SCF       DXF
 SFM       DXFN      SFY       SFYN      HFZ       FCN       A1FR      SF23      BV        DFV       PSY       BL        WYDLLL
 SL        ALFA0H    AK2       BK        BKR       CX0H      CR        CT        DCX0      HIEPS     WDLHEE    WYDLEE    XR
 DK        JX        JY        JZ        JXY       JXZ       JYZ       VWP       VWB       RO        VD        BETA      TETAT
 VK        CHS       SHS       FG        CVX0      WDLVEE    R         V0        DV        XC00      DXC       XMGH      SZT
 FCZM      XNMAX     DVMAX     DLMAX     XC1       XC2       XC3       AP        XNMAXD    VDD       XKKL      XH        CHU
 WYDLEH    HIZH      TAPERH    APH       HXH       BH        BKH       HIEPSH    BKRH      AK2H      CVS       SVS       FGV
 XJTP      XOMEGA
```

```
    IPRINT    IPRINF    KLUCZ8    NKROK     IPRFUL    IPRNOT    IVS       IWYM      ISTER     IZAK      ISTPLT    IKACZ     K6
    IGEOM      IVC      ITEST     IV        NKACZ     NKLAPY
LP        AIR.06.01.01,3.1975
LVG       AIR.06.01.03,4.1973
LVW       AIR.06.01.04,7.1973
LVH       ENG.SC.D.73006,6.1973
NR        ENG.SC.D.71017,9.1971
NVB       AIR.07.01.01,5.1974
LR        ENG.SC.D.72021,9.1972
NP,YP     NASA CR.1975,3.1972
3
33
1.5       2.        3.        4.        6.        8.        10.       -20.
0.        20.       40.       60.       0.        0.25      0.5       1.
.13       .16       .2        .24       .29       .32       .35
.13       .163      .215      .255      .31       .348      .375
.13       .164      .22       .26       .31       .35       .372
.13       .16       .21       .25       .29       .31       .335
.12       .145      .18       .195      .21       .22       .24
.14       .18       .246      .3        .378      .43       .465
.14       .18       .25       .308      .39       .45       .498
.14       .18       .25       .305      .387      .44       .49
.14       .18       .24       .29       .36       .39       .42
.13       .16       .206      .24       .26       .28       .3
.144      .183      .258      .318      .404      .468      .52
.144      .183      .26       .32       .418      .48       .53
.142      .181      .26       .32       .405      .47       .516
.14       .178      .25       .3        .375      .42       .455
.136      .16       .216      .23       .288      .3        .34
.144      .186      .262      .33       .428      .508      .562
.144      .186      .266      .332      .432      .512      .572
.144      .184      .242      .327      .42       .496      .546
.144      .18       .234      .308      .384      .44       .48
.134      .162      .22       .26       .3        .34       .362
1.        2.        3.        4.        5.        6.        7.        0.
10.       20.       30.       40.       50.       60.       0.5       1.
.52       .22       .12       .07       .05       .04       .04
.53       .26       .16       .11       .09       .08        .07
.57       .3        .2        .15       .12       .12       .11
.59       .35       .25       .2        .18       .17       .16
.60       .41       .31       .26       .24       .23       .23
.61       .5        .42       .38       .35       .33        .33
.62       .56       .52       .5        .49       .48       .48
.66       .28       .14       .08       .06       .05       .04
.68       .32       .17       .12       .09       .085       .08
.7        .36       .22       .16       .14       .13       .12
.72       .41       .27       .22       .19       .185      .18
.75       .47       .34       .28       .26       .255      .25
.8        .56       .44       .38       .36       .36       .36
.86       .69       .63       .61       .6        .59        .59
```

```
1.        2.        4.        6.        8.        10.       12.       0.
20.       40.       50.
-0.315    -0.21     -0.18     -0.17     -0.165    -0.165     -0.165
-0.29     -0.22     -0.19     -0.18     -0.18     -0.185    -0.19
-0.32     -0.265    -0.24     -0.238    -0.24     -0.245    -0.25
-0.37     -0.33     -0.322    -0.33     -0.34     -0.348    -0.356
0.        .5        1.        .5        .83       1.
0.        0.25      0.5       0.75      1.        0.        0.2       0.4
0.5       0.6       0.7       0.8       0.9       1.
0.        0.        0.        0.        0.
0.03      0.02      0.015     0.012     0.01
0.18      0.12      0.09      0.07      0.06
.32       .2        .16       .14       .12
.48       .33       .27       .24       .21
.66       .48       .4        .37       .34
.82       .65       .57       .53       .51
.95       .82       .77       .74       .73
1.        1.        1.        1.        1.
0.        20.       40.       50.       0.        .25        .5       1.
1.        1.5       2.        3.        4.        6.        8.        10.
12.
-4.5      -4.3      -3.6      -2.       -2.96     -2.9      -2.3      -1.3
-2.2      -2.1      -1.7      -0.96     -1.4      -1.4      -1.1      -0.5
-1.       -1.       -.8       -.3       -.7       -.7       -.4       0.
-.5       -.5       -.3       .1        -.4       -.4       -.2       .2
-.3       -.3       -.1       .2        -4.8      -4.6      -3.9      -2.2
-3.2      -3.1      -2.6      -1.4      -2.4      -2.38     -1.8      -1.
-1.6      -1.5      -1.1      -.5       -1.2      -1.18     -.8       -.03
-.8       -.76      -.5       0.        -.6       -.5       -.3       .2
-.5       -.4       -.2       .3        -.4       -.3        -.1      .3
-5.15     -5.       -4.2      -2.4      -3.5      -3.4      -2.8      -1.5
-2.7      -2.6      -2.1      -1.1      -1.8      -1.7      -1.3      -.6
-1.4      -1.3      -1.       -.4       -1.       -.9       -.6       0.
-.8       -.7       -.4       .2        -.7       -.6       -.2        .3
-.5       -.5       -.1       .4        -5.8      -5.7      -4.7      -2.7
-4.       -3.9      -3.1      -1.8      -3.1      -3.       -2.4      -1.3
-2.1      -2.       -1.5      -.7       -1.6      -1.5      -1.1      -.4
-1.2      -1.1      -.7       0.        -1.       -.9        -.5      .2
-.8       -.7       -.3       .4        -.7       -.6       -.2       .5
0.05      .1        .15       .2        .25       .3        .35       .4
0.        1.
2.7       5.3       7.5       9.        10.7      12.5      13.5      14.5
5.        9.        13.       16.5      19.8      22.5      25.       27.5
0.        .1        .2        .3        .4        .5        .05       .1
.2        .3
13.2      13.       12.4      11.7      10.6      9.4
12.6      12.2      11.8      11.       10.       8.7
11.6      11.3      10.8      10.       9.        7.7
10.9      10.6      10.2      9.4       8.4       7.
2.        4.        6.        8.        10.       12.       14.
```

```
.6        .84       1.        1.1       1.18      1.23      1.27
0.        .1        .2        .3        .4        .5        .6
0.02      0.04      0.06      0.08      0.1       0.12       0.14
0.16      0.18      0.20      0.22      0.24      0.26
0.        0.02      0.04      0.06      0.08      0.08      0.08
0.        0.06      0.12      0.19      0.25      0.28      0.28
0.        0.15      0.3       0.4       0.5       0.55      0.55
0.        0.23      0.5       0.7       0.88      0.95      0.9
0.        0.38      0.75      1.05      1.29      1.4       1.32
0.        .5        1.        1.4       1.77      1.9       1.8
0.        0.66      1.3       1.85      2.3       2.45      2.38
0.        0.85      1.63      2.3       2.85      3.02      2.75
0.        1.        2.        2.8       3.4       3.6       3.2
0.        1.17      2.85      3.3       4.        4.15      3.65
0.        1.35      2.7       3.75      4.55      4.72      4.
0.        1.55      3.        4.25      5.1       5.2       4.3
0.        1.7       3.4       4.75      5.6       5.65      4.5
0.        .1        .25       .5        .75       1.        1.        2.
4.        6.        8.        10.       12.
7.85      7.9       8.        8.1       8.12      8.15       8.16
8.        8.3       8.65      8.9       9.07      9.2       9.3
8.2       8.7       9.35      9.8       10.1      10.3      10.4
8.46      9.1       10.1      10.75     11.2      11.5       11.8
8.68      9.4       10.6      11.4      11.95     12.4      12.7
8.8       9.7       11.       11.9      12.6      13.1      13.5
0.        20.       40.       60.       1.        1.32      1.78      2.
0.        30.       60.       0.        1.15      2.
0.        .1        .25       .5        .75       1.        1.        2.
4.        6.        8.        10.       12.
-3.       -5.3      -7.5      -8.8      -9.2      -9.5      -9.5
-4.8      -7.5      -11.5     -14.      -15.5     -16.      -16.5
-5.8      -8.9      -13.      -15.7     -17.5     -18.7     -19.7
-6.3      -9.7      -13.6     -16.4     -18.5     -20.4     -21.5
-6.4      -10.      -13.8     -16.7     -19.      -20.7     -22.
-6.5      -10.1     -14.      -16.9     -19.1     -20.8     -22.1
0.        6.        12.       0.        .74       1.
0.        .2        .4        .6        .8        1.        0.        .1
.2        .4        1.
0.        -1.2      -2.5      -2.5      -.9       0.
0.        -1.7      -2.95     -2.9      -1.4      0.
0.        -1.8      -3.15     -3.15     -1.75     0.
0.        -1.9      -3.3      -3.35     -2.05     0.
0.        -2.1      -3.5      -3.52     -2.25     0.
1.        2.        4.        8.        12.       0.        20.       40.
60.       .4        .6        .7        .8        .9
1.03      1.026     1.02      1.005     1.045     1.041     1.029     1.012
1.064     1.055     1.038     1.015     1.078     1.067     1.045     1.017
1.085     1.071     1.049     1.015     1.08      1.07      1.05      1.015
1.13      1.105     1.06      1.02      1.17      1.14      1.085     1.030
1.22      1.17      1.105     1.037     1.234     1.19      1.115     1.040
```

```
1.12      1.11      1.07      1.025     1.2       1.15      1.1       1.035
1.28      1.22      1.13      1.04      1.36      1.27      1.15      1.045
1.39      1.3       1.16      .05       1.24      1.17      1.1       1.0025
1.33      1.27      1.14      1.04      1.48      1.37      1.19      1.05
1.62      1.47      1.24      1.06      1.7       1.52      1.24      1.07
1.38      1.26      1.14      1.04      1.64      1.46      1.2       1.05
2.        1.66      1.26      1.07      2.36      1.86      1.32      1.08
2.54      1.96      1.36      1.09
1.        2.        3.        4.        6.        8.        10.       -20.
0.        20.       40.       70.       0.        .25       .5        1.
2.8       4.5       6.2       7.4       9.        10.2      11.2
2.8       4.8       6.4       7.6       9.6       10.8      11.9
2.8       5.        6.6       7.9       9.8       11.2      12.3
2.8       5.1       6.5       7.7       9.3       10.6      11.5
2.1       3.7       4.4       5.        5.6       6.        6.8
2.8       5.4       7.2       9.        11.       12.6      13.8
3.        5.4       7.5       9.2       11.6      13.5      14.6
3.        5.4       7.4       9.4       11.7      13.4      14.4
3.        5.4       7.2       9.        10.9      12.4      13.3
2.4       4.4       5.4       6.        6.8       7.3       7.8
3.        5.5       7.6       9.2       11.6      13.8      14.6
3.        5.5       7.7       9.5       12.       14.2      15.3
3.        5.5       7.8       9.6       12.       14.       15.2
3.        5.3       7.4       9.        11.       12.8      13.9
2.4       4.2       5.5       5.8       6.8       7.4       8.
2.8       5.4       7.6       9.5       12.2      14.3      15.8
2.8       5.4       7.6       9.6       12.4      14.7      16.4
2.8       5.4       7.6       9.5       12.2      14.5      16.
2.8       5.4       7.5       9.2       11.3      13.2      14.4
2.4       4.1       5.5       6.        6.8       7.4       7.6
1.        4.        7.        10.       13.       16.       .5        1.
-.01      -.038     -.06      -.071     -.08      -.082
-.01      -.038     -.055     -.068     -.08      -.084
0.        0.05      .1        .2        .4        .6        0.        1.
0.        .34       .29       .22       .13       .08
0.        .27       .27       .22       .14       .1
0.        6.        12.       .3        .4        .5        .6
.26       .2        .12       .25       .2        .15       .23       .2
.17       .225      .2        .175
 RO      MS      V       YC      ZC      TETAT   BETA    XAH     SHU     XAV     SVU     HIX     HIZ     B       CT/CR   WYDLE
   ****************  ********************  ********************
         1
WYWAZENIE =20 PROC. =28 PROC. = 36 PROC PREDKOSC V=20 PROC. =28 PROC. =36 PROC.
PREDKOSC V=25%      =30 %     =36 %
CG posit. =-50%     =-30%     =-10%
```