1. Dimension control

According before caculated loads are checked the critical places single elements whole control systems.

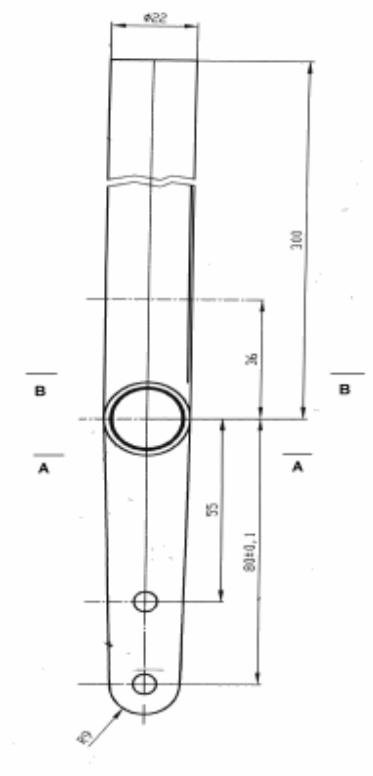
1.1 Check the control elements in cockpit.

1.1.1 Control sticks assembly.

1.1.1.1 Control sticks.

Drawing of control sticks:11 3 641

Importend dimension of the control sticks and checked sections are in following drawing:

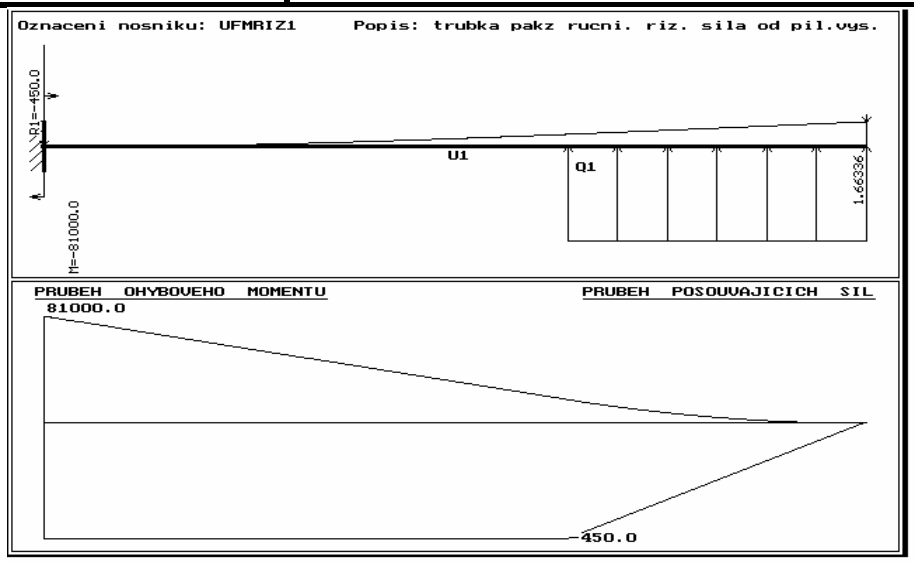


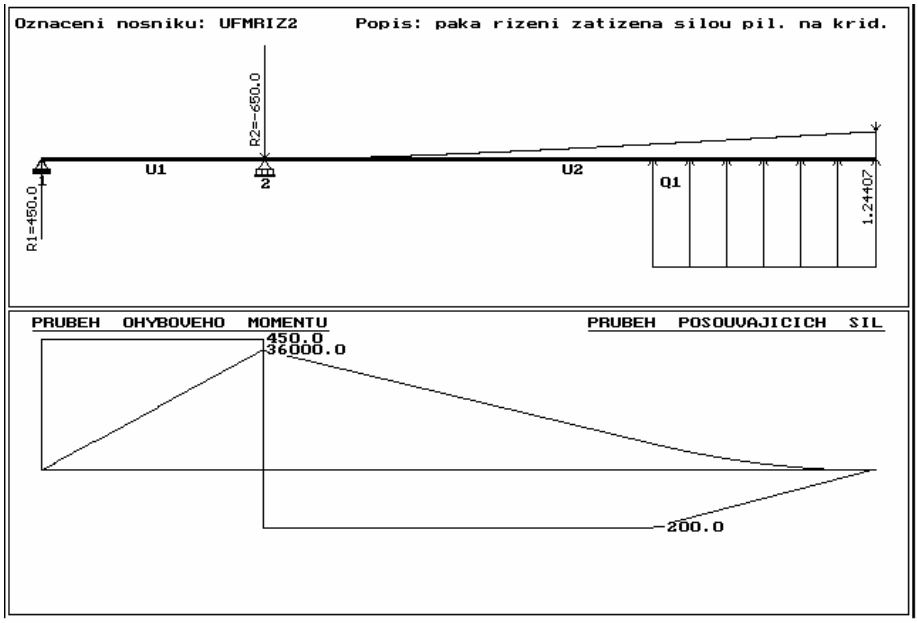
We reflect two situations of load:

-pilot force on ailerons control system -decisive for the check of section A

-pilot force on elevator control system -decesive for the check of section B

Static scheme and course of inertial forces at both of situations are in following fig.:


Oznaceni nosniku: UFMRIZ1 Popis: trubka pakz rucni. riz. sila od pil.vys.
R1=-450.0
U1
Q1
1.66336
M=-81000.0
PRUBEH OHYBOVEHO MOMENTU
PRUBEH POSOUVAJICICH SIL
81000.0
450.0


Oznaceni nosniku: UFMRIZ2 Popis: paka rizeni zatizena silou pil. na krid.
R2=-650.0
U1
U2
Q1
1.24407
R1=450.0
1
2
PRUBEH OHYBOVEHO MOMENTU
PRUBEH POSOUVAJICICH SIL
450.0
36000.0
200.0

For this loads we make check in the critical sections A-A, B-B:

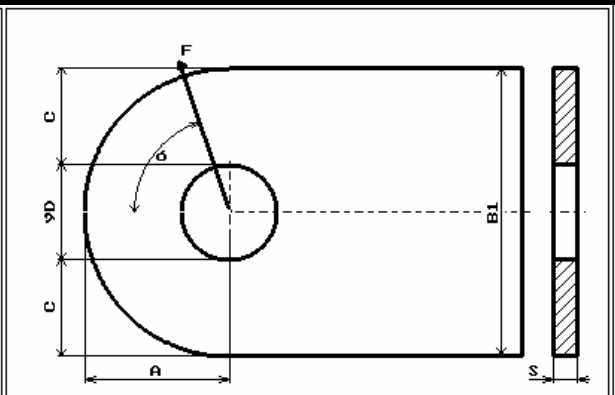
Sektion check					
Description Control sticks section B-B with pilot force for elevator control					
Load		*Geometry of section*		*Tension*	
M1=	81000 [Nmm]	W1=	304.106 [mm^3]	Sigo1=	266.3545 [MPa]
M2=	0 [Nmm]	W2=	304.106 [mm^3]	Sigo2=	0 [MPa]
T1=	450 [N]	Wk=	662.8 [mm^3]	Sig Fo=	0 [MPa]
T2=	0 [N]	S=	66 [mm^2]	Tau1=	9.090682 [MPa]
Fo=	0 [N]	k1 smyk=	1.3333 [ ]	Tau2=	0 [MPa]
Mk=	0 [Nmm]	k2 smyk=	1.3333 [ ]	Taukrut=	0 [MPa]
		Sig red =	266.9743 [MPa]		
		Sig krit =	620 [MPa]		
		f=	2.322321 [ ]		

Section check					
Description Control sticks section A-A with pilot force for ailerons control					
Load		*Geometry of section*		*Tension*	
M1=	36000 [Nmm]	W1=	200 [mm^3]	Sigo1=	180 [MPa]
M2=	0 [Nmm]	W2=	0 [mm^3]	Sigo2=	0 [MPa]
T1=	650 [N]	Wk=	0 [mm^3]	Sig Fo=	0 [MPa]
T2=	0 [N]	S=	60 [mm^2]	Tau1=	14.44408 [MPa]
Fo=	0 [N]	k1 smyk=	1.3333 [ ]	Tau2=	0 [MPa]
Mk=	0 [Nmm]	k2 smyk=	1.3333 [ ]	Taukrut=	0 [MPa]
		Sig red =	182.3034 [MPa]		
		Sig krit =	620 [MPa]		
		f=	3.400924 [ ]		

Both of sections answer.

On the control stick remain to check the eye and plug, they connected the control system. The load is in wirtues of the reaktion R1=450 N from above mentioned static scheme for ailerons. Both control sticks are of course interconnectid between themselves at an rod with the plug, which is situated on the shorter arm. The load of the plug we calculate from arms ratio R2= R1*80/55=654,54 [N]. For this force we perform check.

```
VSTUPNI DATA
                    UFMRIZ3

        oko paky riz.krid.

Pevnost mat.[MPa]:    620.00
Mez kluzu...[MPa]:    480.00
Tahová síla F [N]:      327.3
              ó [°]:    71.00
Tlak. síla Fd [N]:      327.3
           D [mm]:       6.00
           C [mm]:       6.00
           A [mm]:       9.00
           B1[mm]:      18.00
           S [mm]:       1.50
Ulození: 7=>H7;8=>H8;9=>oko
tvoří vnejsi krouzek loz: 7
Vliv nepresne vyr.-F3: 1.00
Vliv druhu  zat.  -F4: 0.60
```




```
I. KONTROLA OKA S OHLEDEM NA PEVNOST:
1. utrzeni oka: Ń =    21.82 MPa
                Ńpt =  620.00 MPa
        Nadjistota = 28.41
2. roztrzeni oka a vysmeknuti cepu:
                Ńotl. =   36.37 MPa
          Ńotl.dov. =  885.36 MPa
        Nadjistota = 24.35
3. Otlaceni oka (pro cisty tlak):
                Ńotl. =   36.37 MPa
          Ńotl.dov. = 1562.40 MPa
        Nadjistota = 42.96

II. KONTROLA OKA S OHLEDEM NA DEFORMACI
1. utrzeni oka: Ń =    18.18 MPa
                Ńpt =  211.14 MPa
        Nadjistota = 11.61
2. roztrzeni oka a vysmeknuti cepu:
                Ńotl. =   36.37 MPa
          Ńotl.dov. =  304.38 MPa
        Nadjistota = 8.37
3. Otlaceni oka (pro cisty tlak):
                Ńotl. =   36.37 MPa
          Ńotl.dov. =  361.23 MPa
        Nadjistota = 9.93
```

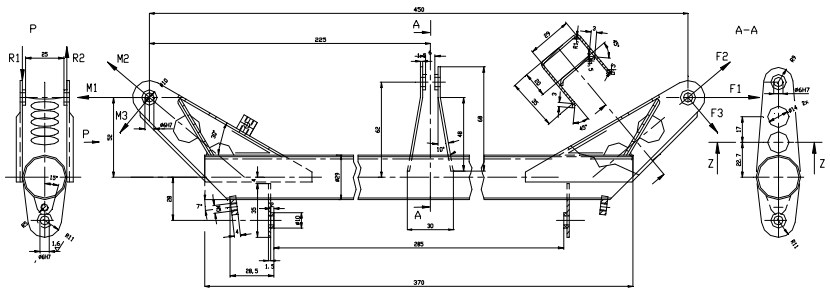
1.1.1.2 Interconnection rod of control sticks.

The check is performed for buckling in situation, when pilots act oposite according P-ULL1.

Buckling	
Rod– drawing 11 3 625 tube 12/1	
l=	449 [mm]
J1=	528 mm^4]
E1=	72000 [MPa]
J2=	0 mm^4]
E2=	0 [MPa]
Fkrit=	1861.116 [N] 17
f=	2.843395 [] 621

1.1.1.3 Countershaft of control.

Countershaft is in drawing 11 3 621, the necessery value for calculation has following picture.



We perform following check:

Check of the eye of plug, which connection control sticks with countershaft.

Decisive situation is pilot load on elevator control from Slovak regulations.

Reaction in eye we find out from maximal moment of control stick with following calculation:

R1=-R2= M/r

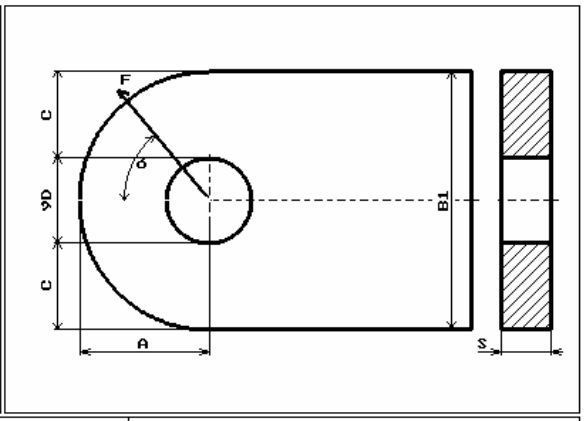
r- distance between two eyes welded countershaft, highness is r=25mm

M- assumed moment of control sticks load from pilot force on elevator in fix place M=81000Nmm

R1=-R2= 3240 N

For this force we perform check of eye.

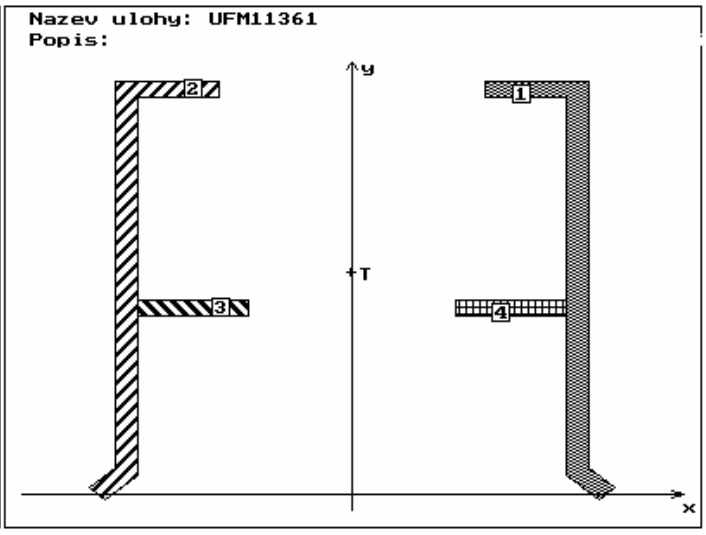
```
VSTUPNI DATA
                    UFMRIZ5

          oko konzoly predlohy

Pevnost mat.[MPa]:     620.00
Mez kluzu...[MPa]:     480.00
Tahová síla F [N]:    3240.0
              ó [°]:    50.00
Tlak. síla Fd [N]:    3240.0
              D [mm]:    6.00
              C [mm]:    6.00
              A [mm]:    9.00
              B1[mm]:   18.00
              S [mm]:    3.50
Ulození: 7=>H7;8=>H8;9=>oko
tvoří vnejsí krouzek loz: 9
Vliv nepresne vyr.-F3: 1.00
Vliv druhu  zat.  -F4: 0.70
```




```
I. KONTROLA OKA S OHLEDEM NA PEVNOST:
1. utrzeni oka: ň =    92.57 MPa
                ňpt =  620.00 MPa
        Nadjistota = 6.70
2. roztrzeni oka a vysmeknuti cepu:
                ňotl. =   154.29 MPa
             ňotl.dov. =  896.52 MPa
        Nadjistota = 5.81
3. Otlaceni oka (pro cisty tlak):
                ňotl. =   154.29 MPa
             ňotl.dov. = 1865.68 MPa
        Nadjistota = 12.09

II. KONTROLA OKA S OHLEDEM NA DEFORMACI
1. utrzeni oka: ň =    77.14 MPa
                ňpt =  296.64 MPa
        Nadjistota = 3.85
2. roztrzeni oka a vysmeknuti cepu:
                ňotl. =   154.29 MPa
             ňotl.dov. =  442.95 MPa
        Nadjistota = 2.87
3. Otlaceni oka (pro cisty tlak):
                ňotl. =   154.29 MPa
             ňotl.dov. =  544.44 MPa
        Nadjistota = 3.53
```

Check of welded tube for decide event pilot load on ailerons and elevator controls, both from Slovak regulations. Critical section is on fig. 500mm from off eye. His value are following:

```
Celkova plocha prurezu:
     F: 154.74

 Souradnice teziste:
   XT:   0.0000
   YT:  20.2468

Momenty setrvacnosti:
  JXT: 19466.49
  JYT: 32218.78
 JXYT:   0.00

Hlavni osy setrvacnosti:
 Uhel sklonu:   0.00°

Hlavni momenty setrvacnosti
 JXOT: 19466.49
 JYOT: 32218.78

Prurezove moduly:
 WXT1: 1112.17
 WXT2: 936.92
 WYT1: 1812.05
 WYT2: 1812.05
WXOT1: 1112.17
WXOT2: 936.92
WYOT1: 1812.05
WYOT2: 1812.05
```



The load for caculation of countershaft we use from static scheme mantioned abov in calculation of control stick. For load from elevator force it is M1=81000 Nmm and the force F=450 N in the plugs axis, for the ailerons case it is only force R1=650 N, perpendicular to the plug axis.

For the check of section we perform the forces decay and moments in to axis of the check section. The decay is indicate in scheme of welding part.

R2=R1*cos 40

R3=R1*sin 40

M2=M1*cos 40

M3=M1*sin 40

Critical section in both cases is loaded at bend and shifted force, in aileron case into the bagrain pressured force. The bend in the section from force R3 or F we calculate on the arm r=50mm. The checks section for both cases are in following tab.

Section check

Description Countershaft section loaded by pilot force on aileron control

Load		*section geometry*		*Tension*	
M1=	20890 [Nmm]	W1=	936.92 [mm^3]	Sigo1=	22.29646 [MPa]
M2=	0 [Nmm]	W2=	1112 [mm^3]	Sigo2=	0 [MPa]
T1=	417.81 [N]	Wk=	1740 [mm^3]	Sig Fo=	3.217785 [MPa]
T2=	0 [N]	S=	154.74 [mm^2]	Tau1=	3.600013 [MPa]
Fo=	497.92 [N]	k1 smyk=	1.3333 [ ]	Tau2=	0 [MPa]
Mk=	0 [Nmm]	k2 smyk=	1.3333 [ ]	Taukrut=	0 [MPa]
		Sig red =	26.5107 [MPa]		
		Sig krit =	620 [MPa]		
		f=	23.38679 [ ]		

Section check

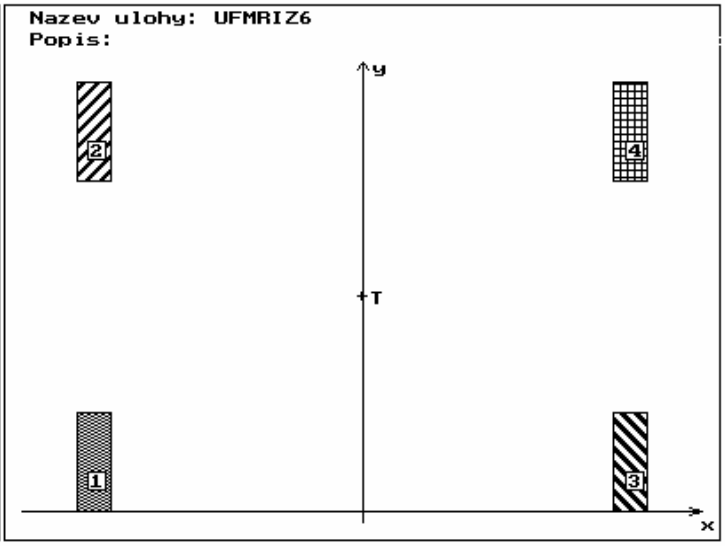
Dscription Countershaft section loaded by pilot force on elevator control

Load		*section geometry*		*Tension*	
M1=	0 [Nmm]	W1=	936.92 [mm^3]	Sigo1=	0 [MPa]
M2=	74565 [Nmm]	W2=	1112 [mm^3]	Sigo2=	67.05486 [MPa]
T1=	0 [N]	Wk=	1740 [mm^3]	Sig Fo=	0 [MPa]
T2=	450 [N]	S=	154.74 [mm^2]	Tau1=	0 [MPa]
Fo=	0 [N]	k1 smyk=	1.3333 [ ]	Tau2=	3.877375 [MPa]
Mk=	62049 [Nmm]	k2 smyk=	1.3333 [ ]	Taukrut=	35.66034 [MPa]
		Sig red =	103.6787 [MPa]		
		Sig krit =	620 [MPa]		
		f=	5.980012 [ ]		

The check of middle arm of countershaft, created with couple of sheet arms with lightening holes (see wiew A-A in the scheme). Critical section is in place the lightening hole on r=40 mm from plug axis. The arm is loaded with force from rod 1, which we use for calculation of load (decisive Slovak regulations)

F=1423 N. Bending moment in the checked section is then M=F*r= 1423*40=5692 Nmm. On the same force we check also eye.

```
Celkova plocha prurezu:
    F: 36.00
 Souradnice teziste:
   XT:  0.0000
   YT: 13.0000
Momenty setrvacnosti:
  JXT: 3708.00
  JYT: 5190.75
 JXYT:  0.00
Hlavni osy setrvacnosti:
 Uhel sklonu:  0.00°
Hlavni momenty setrvacnosti
 JXOT: 3708.00
 JYOT: 5190.75
Prurezove moduly:
 WXT1: 285.23
 WXT2: 285.23
 WYT1: 407.12
 WYT2: 407.12
WXOT1: 285.23
WXOT2: 285.23
WYOT1: 407.12
WYOT2: 407.12
```



Section check

Description Countershaft section loaded by pilot force on elevator control

Load		*section geometry*		*Tension*	
M1=	56920 [Nmm]	W1=	285 [mm^3]	Sigo1=	199.7193 [MPa]
M2=	0 [Nmm]	W2=	0 [mm^3]	Sigo2=	0 [MPa]
T1=	1423 [N]	Wk=	0 [mm^3]	Sig Fo=	0 [MPa]
T2=	0 [N]	S=	36 [mm^2]	Tau1=	52.70239 [MPa]
Fo=	0 [N]	k1 smyk=	1.3333 [ ]	Tau2=	0 [MPa]
Mk=	0 [Nmm]	k2 smyk=	1.3333 [ ]	Taukrut=	0 [MPa]
		Sig red =	225.8273 [MPa]		
		Sig krit =	620 [MPa]		
		f=	2.745461 [ ]		

The last check on countershaft is the tube check, which interconnect both control sticks. We take into account two cases of loads:
The first is act one pilot on elevator control according Slovak regulation and the second simultaneusly act both pilots on elevator according JAR-VLA. Static schemes and calculation internal forces following together with check critical section in the middle of tube for both cases. The section is loaded with bending moment , shifted force and torgue.

VSTUPNI DATA

UFMRIZ7

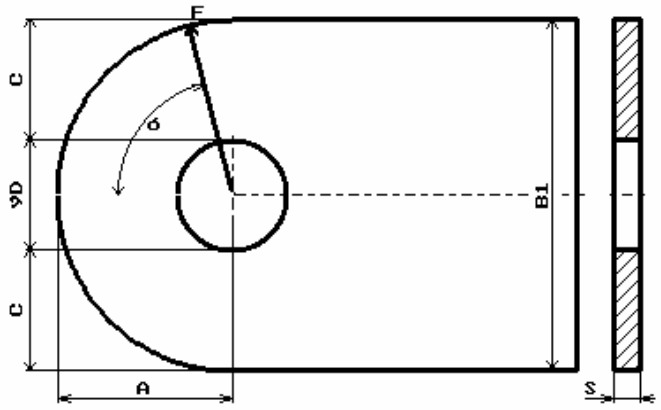
oko paky nahonu vys.

Pevnost mat.[MPa]:	620.00
Mez kluzu...[MPa]:	480.00
Tahová síla F [N]:	643.0
ó [°]:	75.00
Tlak. síla Fd [N]:	711.5
D [mm]:	6.00
C [mm]:	6.50
A [mm]:	9.50
B1[mm]:	19.00
S [mm]:	1.50

Ulození: 7=>H7;8=>H8;9=>oko tvoří vnejsí krouzek loz: 8

Vliv nepresne vyr.-F3: 1.00

Vliv druhu zat. -F4: 0.70



I. KONTROLA OKA S OHLEDEM NA PEVNOST:

1. utrzeni oka: ŕ = 39.57 MPa
ŕpt = 620.00 MPa
Nadjistota = 15.67

2. roztrzeni oka a vysmeknuti cepu:
ŕotl. = 71.44 MPa
ŕotl.dov. = 936.77 MPa
Nadjistota = 13.11

3. Otlaceni oka (pro cisty tlak):
ŕotl. = 79.06 MPa
ŕotl.dov. = 1562.40 MPa
Nadjistota = 19.76

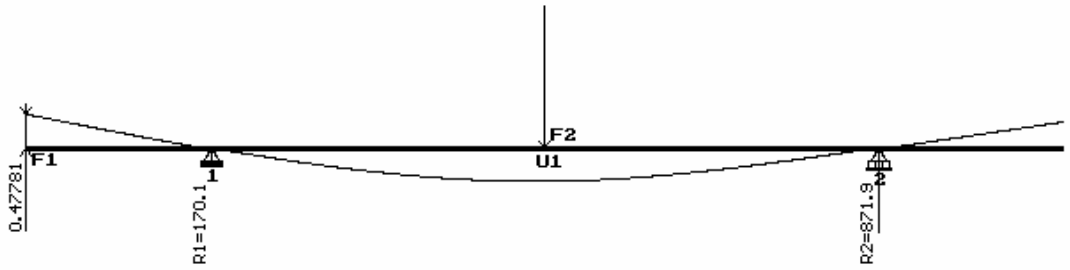
II. KONTROLA OKA S OHLEDEM NA DEFORMACI

1. utrzeni oka: ŕ = 32.97 MPa
ŕpt = 325.14 MPa
Nadjistota = 9.86

2. roztrzeni oka a vysmeknuti cepu:
ŕotl. = 71.44 MPa
ŕotl.dov. = 480.09 MPa
Nadjistota = 6.72

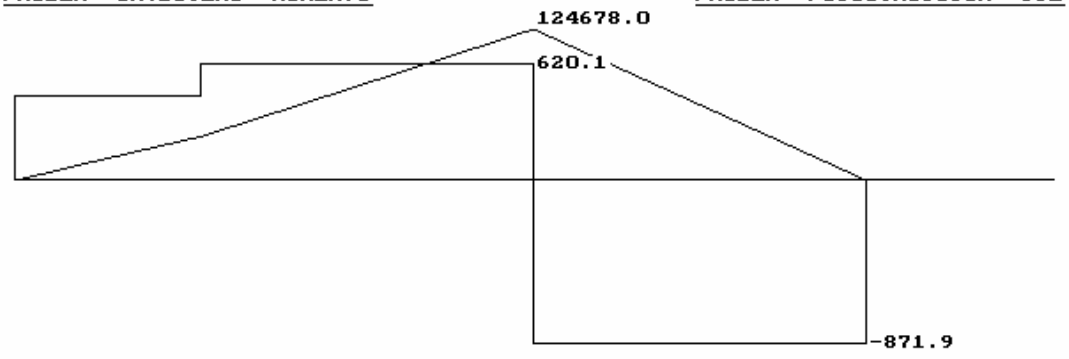
3. Otlaceni oka (pro cisty tlak):
ŕotl. = 79.06 MPa
ŕotl.dov. = 556.28 MPa
Nadjistota = 7.04

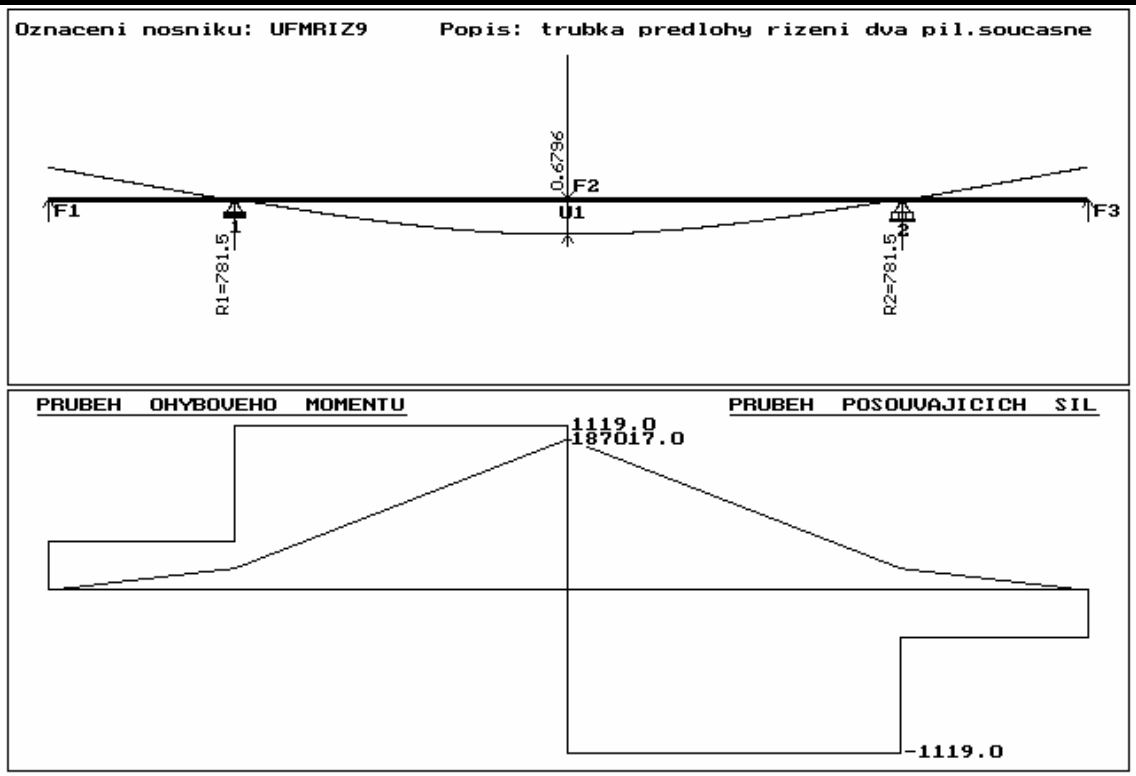
Oznaceni nosniku: UFMRIZ8 Popis: trubka predlohy rizeni



PRUBEH OHYBOVEHO MOMENTU

PRUBEH POSOUVAJICICH SIL





Section check

Description Tube of countershaft loaded by pilot force on elevator control

Load		*section geometry*		*Tension*	
M1=	124678 [Nmm]	W1=	660.5 [mm^3]	Sigo1=	188.7631 [MPa]
M2=	0 [Nmm]	W2=	1112 [mm^3]	Sigo2=	0 [MPa]
T1=	871 [N]	Wk=	1321 [mm^3]	Sig Fo=	0 [MPa]
T2=	0 [N]	S=	91 [mm^2]	Tau1=	12.76159 [MPa]
Fo=	0 [N]	k1 smyk=	1.3333 [ ]	Tau2=	0 [MPa]
Mk=	104400 [Nmm]	k2 smyk=	1.3333 [ ]	Taukrut=	79.03104 [MPa]
		Sig red =	263.3155 [MPa]		
		Sig krit =	620 [MPa]		
		f=	2.35459 [ ]		

Section check

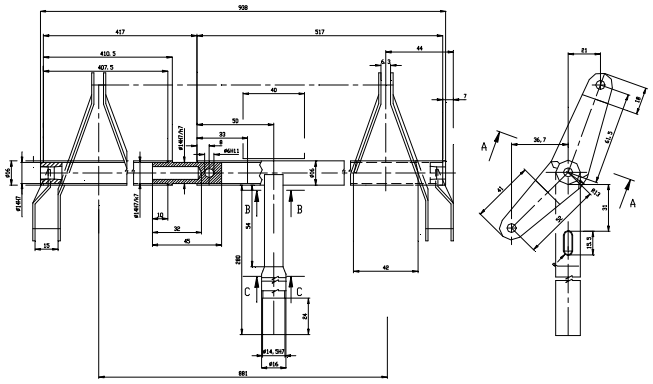
Description Tube of countershaft loaded by pilot force on elevator control

Load		*section geometry*		*Tension*	
M1=	187019 [Nmm]	W1=	660.5 [mm^3]	Sigo1=	283.1476 [MPa]
M2=	0 [Nmm]	W2=	1112 [mm^3]	Sigo2=	0 [MPa]
T1=	1119 [N]	Wk=	1321 [mm^3]	Sig Fo=	0 [MPa]
T2=	0 [N]	S=	91 [mm^2]	Tau1=	16.39519 [MPa]
Fo=	0 [N]	k1 smyk=	1.3333 [ ]	Tau2=	0 [MPa]
Mk=	78300 [Nmm]	k2 smyk=	1.3333 [ ]	Taukrut=	59.27328 [MPa]
		Sig red =	321.0536 [MPa]		
		Sig krit =	620 [MPa]		
		f=	1.931141 [ ]		

Conclusion: All of control stick asembly comply with requierements of regulations UL-1, Bfu, P-ULL1 and JAR-VLA.

1.1.2 Flap control system.

Flap control system is on the drawing 11 3 931, for documentation of calculation we use following simplify fig.:

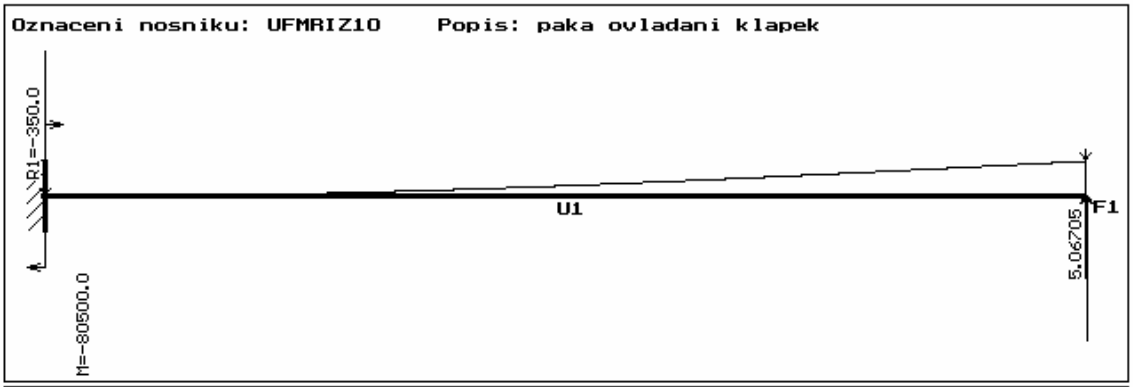


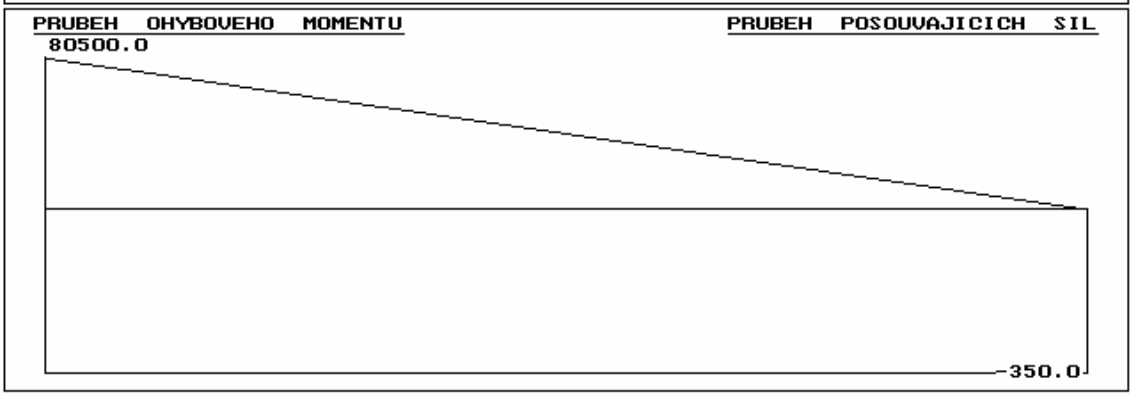
1.1.2.1 Flap kontrol system – welding element

We perform check own lever of flaps control system on the pilot force according regulations JAR-VLA F=350 M. Static scheme for calculation and course of internal forces is on following fig.

We check the section B-B and C-C in distance 230 mm and 176 mm from the force place on control lever.

Section B-B is created from the tube 16/1 flatting on rectangle. The section characteristic are introduced in the fig. Sektion C-C is tube 16/1.





VYSLEDKY VYPOCTU

Celkova plocha prurezu:
F: 52.00

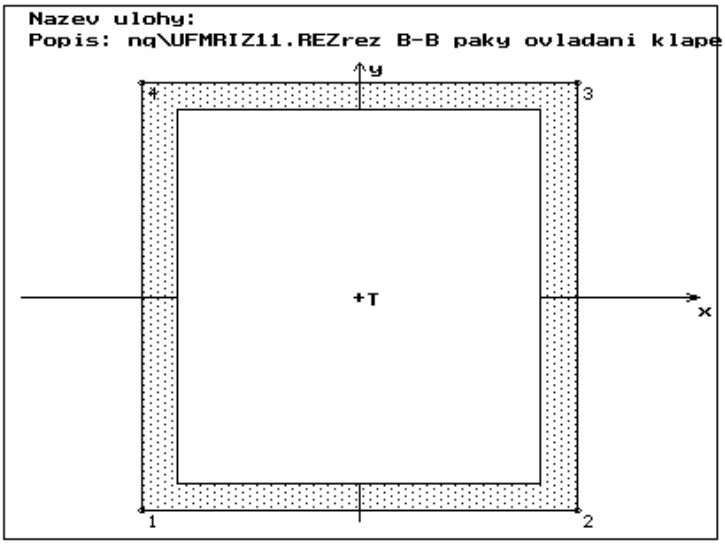
Souradnice teziste:
XT: 0.0000
YT: 0.0000

Momenty setrvacnosti:
JXT: 1809.33
JYT: 1137.33
JXYT: 0.00

Hlavni osy setrvacnosti:
Uhel sklonu: 0.00°

Hlavni momenty setrvacnosti
JXOT: 1809.33
JYOT: 1137.33

Prurezove moduly:
WXT1: 226.17
WXT2: 226.17
WYT1: 189.56
WYT2: 189.56
WXOT1: 226.17
WXOT2: 226.17
WYOT1: 189.56
WYOT2: 189.56



Section check					
Description Flaps control lewer –section B-B					
Load		*section geometry*		*Tension*	
M1=	80500 [Nmm]	W1=	226 [mm^3]	Sigo1=	356.1947 [MPa]
M2=	0 [Nmm]	W2=	0 [mm^3]	Sigo2=	0 [MPa]
T1=	350 [N]	Wk=	0 [mm^3]	Sig Fo=	0 [MPa]
T2=	0 [N]	S=	47.1 [mm^2]	Tau1=	9.907749 [MPa]
Fo=	0 [N]	k1 smyk=	1.3333 [ ]	Tau2=	0 [MPa]
Mk=	0 [Nmm]	k2 smyk=	1.3333 [ ]	Taukrut=	0 [MPa]
		Sig red =	356.7454 [MPa]		
		Sig krit =	620 [MPa]		
		f=	1.737934 [ ]		

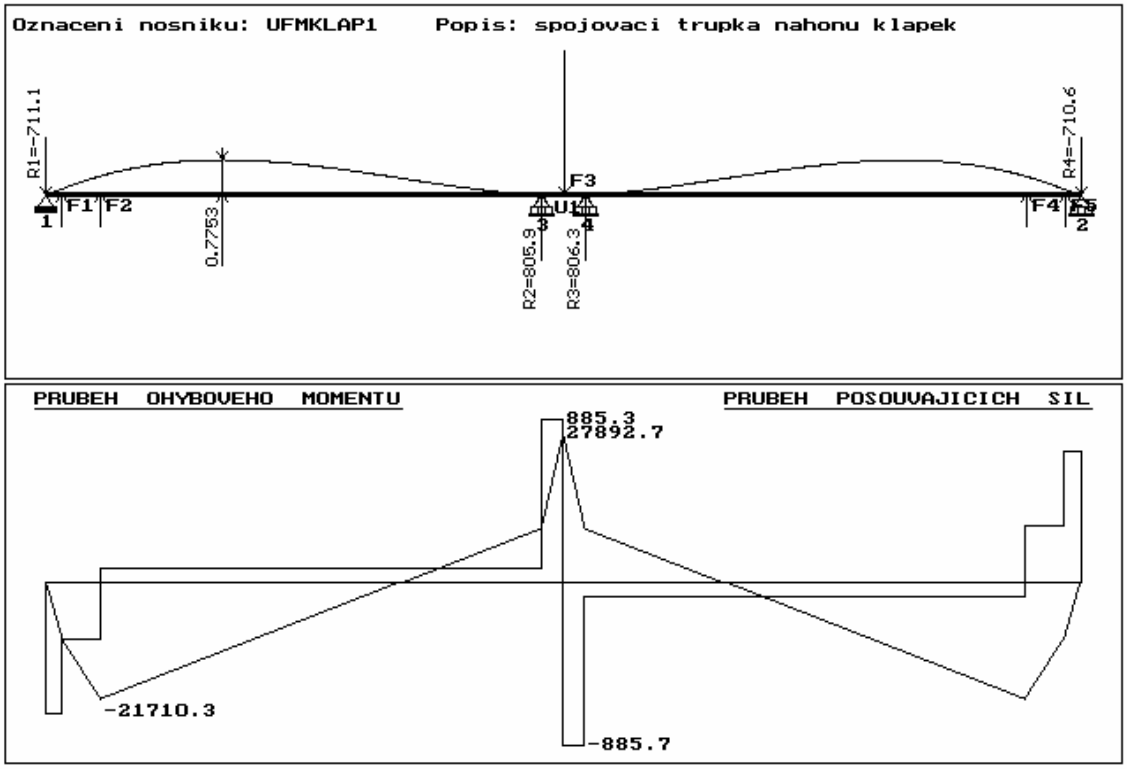
Section check					
Description Flaps control lewer –sectionC-C					
Load		*section geometry*		*Tension*	
M1=	61600 [Nmm]	W1=	166.3 [mm^3]	Sigo1=	370.4149 [MPa]
M2=	0 [Nmm]	W2=	0 [mm^3]	Sigo2=	0 [MPa]
T1=	350 [N]	Wk=	0 [mm^3]	Sig Fo=	0 [MPa]
T2=	0 [N]	S=	47.1 [mm^2]	Tau1=	9.907749 [MPa]
Fo=	0 [N]	k1 smyk=	1.3333 [ ]	Tau2=	0 [MPa]
Mk=	0 [Nmm]	k2 smyk=	1.3333 [ ]	Taukrut=	0 [MPa]
		Sig red =	370.9446 [MPa]		
		Sig krit =	620 [MPa]		
		f=	1.671409 [ ]		

Next checked element is tube of countershaft of flaps control, which has welded arms lewer. Load of this element we take from hinge moment the flaps accoording JAR-VLA (this load proves as decisive). The check we take in lock up position of flap, which is given with fix position of flaps lewer in the coulisse.

The load results from forces in rod 1: F1+ F2=791.1 N, this load act torque of countershaft M=44296 Nmm, from this we calculate reaction in the coulisse of control lewer F3=1771 N.

Static scheme of load and course internal forces are in following fig.

The contershaft is supported sidewards in fuselage and two of middle supports creats tunnel with bearings.



The check of critical section in the middle part following:

Section check

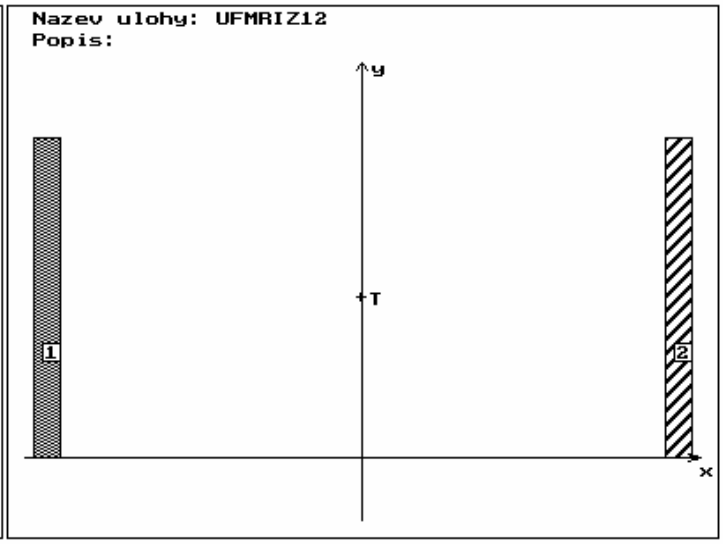
Description Check of countershaft of flaps – middle section

Load		*section geometry*		*Tension*	
M1=	27892 [Nmm]	W1=	166.3 [mm^3]	Sigo1=	167.721 [MPa]
M2=	0 [Nmm]	W2=	0 [mm^3]	Sigo2=	0 [MPa]
T1=	885.7 [N]	Wk=	332.6 [mm^3]	Sig Fo=	0 [MPa]
T2=	0 [N]	S=	47.1 [mm^2]	Tau1=	25.07227 [MPa]
Fo=	0 [N]	k1 smyk=	1.3333 [ ]	Tau2=	0 [MPa]
Mk=	44296 [Nmm]	k2 smyk=	1.3333 [ ]	Taukrut=	133.181 [MPa]
		Sig red =	358.1993 [MPa]		
		Sig krit =	620 [MPa]		
		f=	1.73088 [ ]		

The last of checked element on flaps control is the lever of drive rod 1, sidewards of the countershaft. We perform then calculation on bending from force in rod 1 in the critical section in distance 40 mm from axis of plug. Mo=791,4*40=31644 Nmm.

Sections characteristic of the checked place are in following fig.

```
Celkova plocha prurezu:
     F: 72.00
 Souradnice teziste:
    XT:   0.0000
    YT:  12.0000
Momenty setrvacnosti:
   JXT: 3456.00
   JYT: 22063.50
  JXYT:   0.00
Hlavni osy setrvacnosti:
 Uhel sklonu:   0.00°
Hlavni momenty setrvacnosti
  JXOT: 3456.00
  JYOT: 22063.50
Prurezove moduly:
  WXT1: 288.00
  WXT2: 288.00
  WYT1: 1208.96
  WYT2: 1208.96
 WXOT1: 288.00
 WXOT2: 288.00
 WYOT1: 1208.96
 WYOT2: 1208.96
```



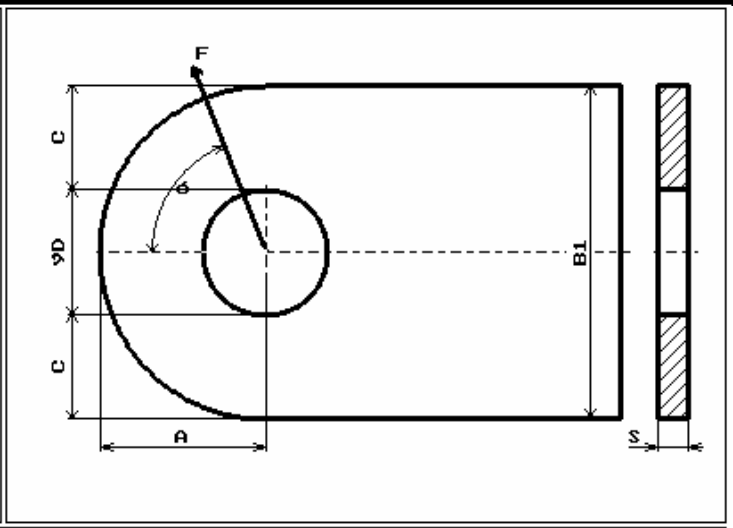
Section check

Description Check of driving lever of flaps bar

Load		*section geometry*		*Tension*	
M1=	31644 [Nmm]	W1=	288 [mm^3]	Sigo1=	109.875 [MPa]
M2=	0 [Nmm]	W2=	0 [mm^3]	Sigo2=	0 [MPa]
T1=	791 [N]	Wk=	0 [mm^3]	Sig Fo=	0 [MPa]
T2=	0 [N]	S=	72 [mm^2]	Tau1=	14.64778 [MPa]
Fo=	0 [N]	k1 smyk=	1.3333 [ ]	Tau2=	0 [MPa]
Mk=	0 [Nmm]	k2 smyk=	1.3333 [ ]	Taukrut=	0 [MPa]
		Sig red =	113.7134 [MPa]		
		Sig krit =	620 [MPa]		
		f=	5.452302 [ ]		

The last of the perform check is the check of eye of driving lever of rod 1

```
VSTUPNI DATA
                    UFMRIZ13

          paka nahonu tahla kl

Pevnost mat.[MPa]:     620.00
Mez kluzu...[MPa]:     480.00
Tahová síla F [N]:     395.5
            ó [°]:     68.00
Tlak. síla Fd [N]:     132.0
              D [mm]:    6.00
              C [mm]:    5.00
              A [mm]:    8.00
              B1[mm]:   16.00
              S [mm]:    1.50
Ulození: 7=>H7;8=>H8;9=>oko
tvoří vnejsi krouzek loz: 8
Vliv nepresne vyr.-F3: 1.00
Vliv druhu  zat.  -F4: 0.70
```

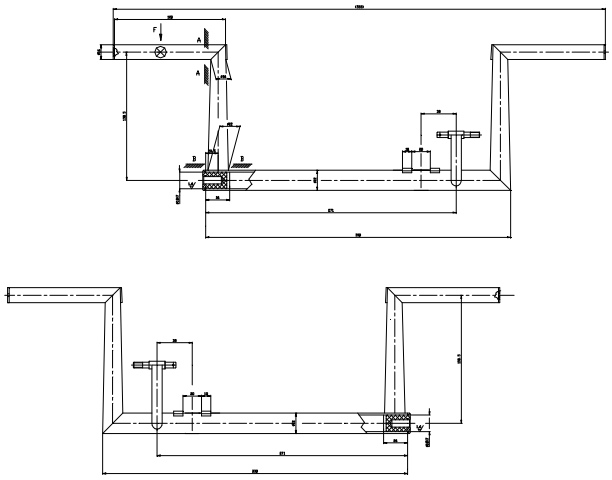



```
I. KONTROLA OKA S OHLEDEM NA PEVNOST:
1. utrzeni oka: ŕ =    31.64 MPa
                ŕpt =  620.00 MPa
        Nadjistota = 19.60
2. roztrzeni oka a vysmeknuti cepu:
              ŕotl. =    43.94 MPa
          ŕotl.dov. =   767.56 MPa
        Nadjistota = 17.47
3. Otlaceni oka (pro cisty tlak):
              ŕotl. =    14.67 MPa
          ŕotl.dov. =  1562.40 MPa
        Nadjistota = 106.53

II. KONTROLA OKA S OHLEDEM NA DEFORMACI
1. utrzeni oka: ŕ =    26.37 MPa
                ŕpt =  327.90 MPa
        Nadjistota = 12.44
2. roztrzeni oka a vysmeknuti cepu:
              ŕotl. =    43.94 MPa
          ŕotl.dov. =   443.15 MPa
        Nadjistota = 10.08
3. Otlaceni oka (pro cisty tlak):
              ŕotl. =    14.67 MPa
          ŕotl.dov. =   561.00 MPa
        Nadjistota = 38.25
```

Conclusion: Whole assembly of flaps control comply with requirements following regulations: UL-1, Bfu, P-ULL1 and JAR-VLA.

1.1.3 Foot control

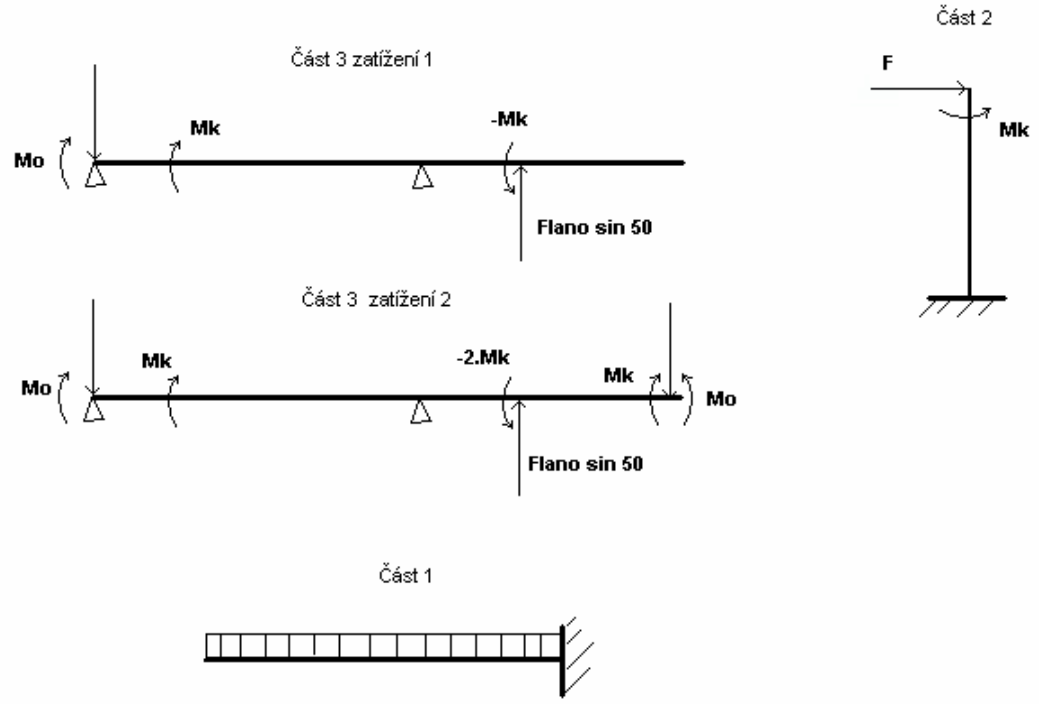
Foot control is in the drawing 11 3 551, for using in calculation is mentioned following distance scheme:



Whole rudder pedals assembly we distribute on 3 parts and try to solve it particulary. Distribution is indicated in the fig. with section.
For calculation we take two check situations:

1. lean into pedals according UL-2 F=600 N and according JAR-VLA F=1000 N
2. simultaneously act of 75% forces from buth pilots.

Static scheme for calculation all of three parts is in following fig. Critical section is always the place of connection of the other part. There is perform the check. Necessery is it takes into account ,then exist two of versions of foot pedals from different tubes.



By first two parts of foot pedals is it pssible the load in the critical section direct figure out.

Part 1
Mo= F* 125/2 = 600*125/2=3 7500 Nmm for UL-2 a Mo= 1000*125/2 = 62 500 Nmm

T= F

Mk= 0

Section check
Description Foot pedals – check of part 1

Load		*section geometry*		*Tension*	
M1=	62500 [Nmm]	W1=	166.3 [mm^3]	Sigo1=	375.8268 [MPa]
M2=	0 [Nmm]	W2=	0 [mm^3]	Sigo2=	0 [MPa]
T1=	1000 [N]	Wk=	332.6 [mm^3]	Sig Fo=	0 [MPa]
T2=	0 [N]	S=	47.1 [mm^2]	Tau1=	28.30786 [MPa]
Fo=	0 [N]	k1 smyk=	1.3333 [ ]	Tau2=	0 [MPa]
Mk=	0 [Nmm]	k2 smyk=	1.3333 [ ]	Taukrut=	0 [MPa]
		Sig red =	380.0673 [MPa]		
		Sig krit =	620 [MPa]		
		f=	1.63129 [ ]		

Part 2

Mo= F*138 = 600*138=82 800 Nmm for UL-2 a Mo= 1000*138 = 138 000 Nmm

T= F

Mk= F* 125/2 = 600*125/2=37 500 Nmm for UL-2 a Mo= 1000*125/2 = 62 500 Nmm

Section check

Description Foot pedals – part 2 – tube 16/2

Load		*section geometry*		*Tension*	
M1=	82800 [Nmm]	W1=	274.5 [mm^3]	Sigo1=	301.6393 [MPa]
M2=	0 [Nmm]	W2=	0 [mm^3]	Sigo2=	0 [MPa]
T1=	600 [N]	Wk=	549 [mm^3]	Sig Fo=	0 [MPa]
T2=	0 [N]	S=	88 [mm^2]	Tau1=	9.090682 [MPa]
Fo=	0 [N]	k1 smyk=	1.3333 [ ]	Tau2=	0 [MPa]
Mk=	37500 [Nmm]	k2 smyk=	1.3333 [ ]	Taukrut=	68.30601 [MPa]
		Sig red =	339.0388 [MPa]		
		Sig krit =	620 [MPa]		
		f=	1.828699 [ ]		

Section check

Description Foot control check – part 2 – tube 22/1

Load		*section geometry*		*Tension*	
M1=	138000 [Nmm]	W1=	331.4 [mm^3]	Sigo1=	416.4152 [MPa]
M2=	0 [Nmm]	W2=	0 [mm^3]	Sigo2=	0 [MPa]
T1=	1000 [N]	Wk=	662.8 [mm^3]	Sig Fo=	0 [MPa]
T2=	0 [N]	S=	66 [mm^2]	Tau1=	20.20152 [MPa]
Fo=	0 [N]	k1 smyk=	1.3333 [ ]	Tau2=	0 [MPa]
Mk=	62500 [Nmm]	k2 smyk=	1.3333 [ ]	Taukrut=	94.29692 [MPa]
		Sig red =	475.2275 [MPa]	K plastic =	1.27 [ ]
		Sig krit =	620 [MPa]		
		f=	1.304638 [ ]	**f=**	1.656891

Part 3
Course of internal forces will be calculated futher, bud addition bending and torque moments is possible figure up with following method:
For case 1.

Mo= F* 125/2 = 600*125/2=37 500 Nmm for UL-2 a Mo= 1000*125/2 = 62 500 Nmm

Flano * sin 50deg = 1380*sin 50 =1057 N for UL-2 a Flano * sin 50deg = 1790*sin 50 =1371 N

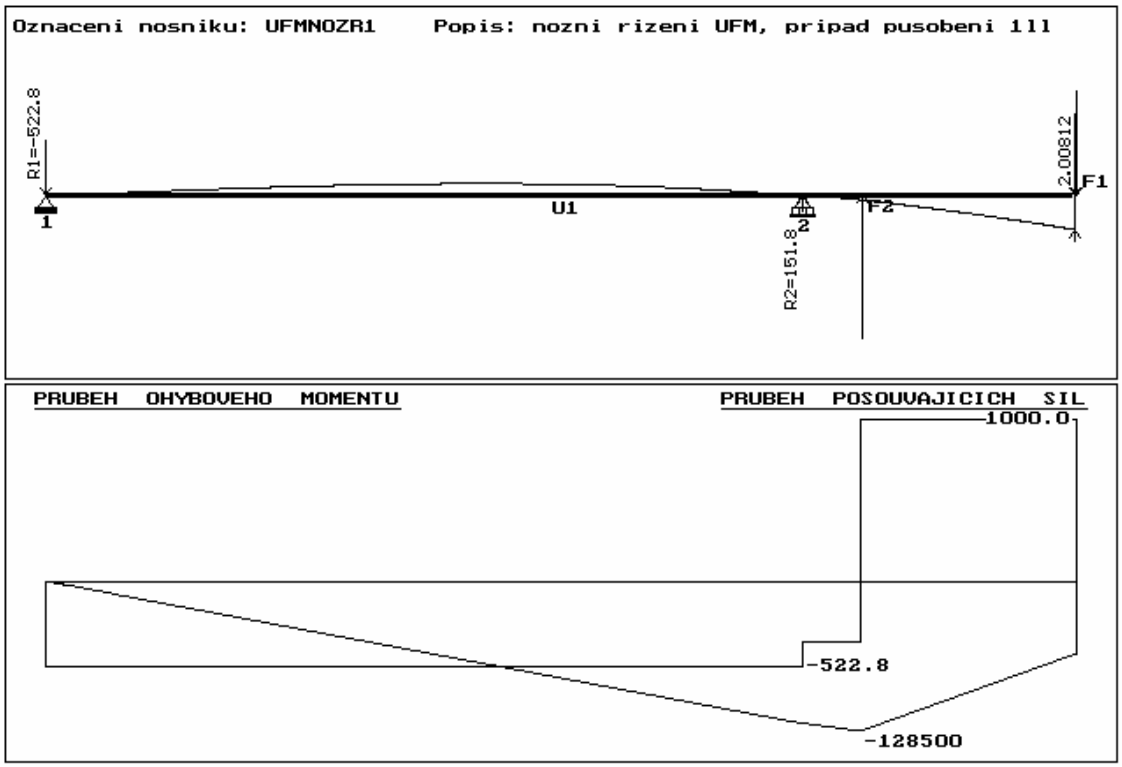
Mk= F*138 = 600*138=82 800 Nmm for UL-2 a Mo= 1000*138 = 138 000 Nmm

For case 2.

Mo= F* 125/2 = 450*125/2=28 125 Nmm for UL-2

Flano * sin 50deg = 2070*sin 50 =1585 N for UL-2

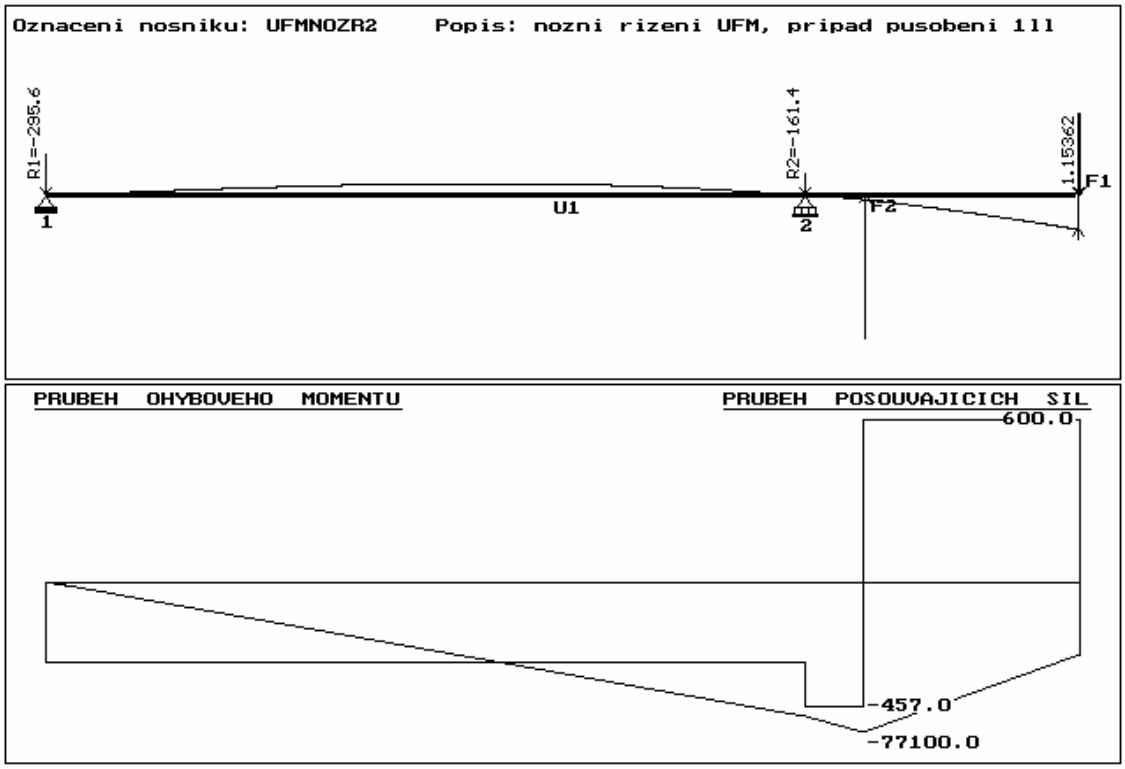
Mk= F*138 = 450*138=62 100 Nmm for UL-2



Section check

Description Foot pedals check – version tube 22/1

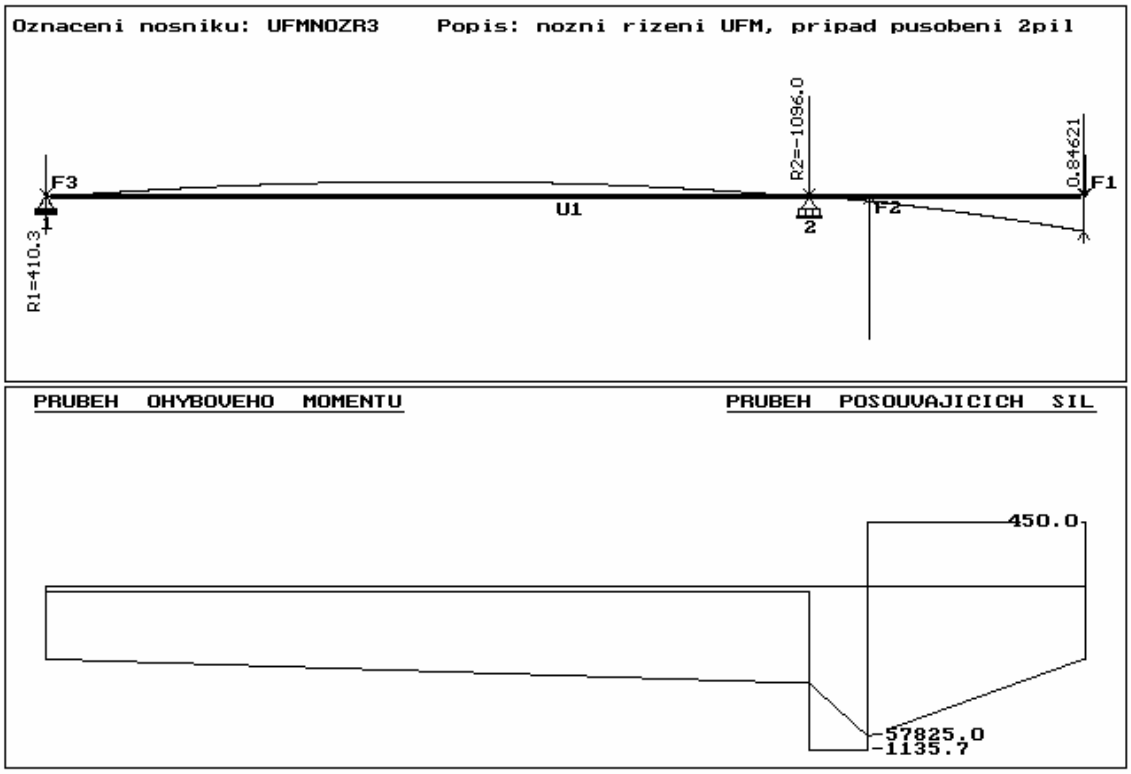
Load		*section geometry*		*Tension*	
M1=	128500 [Nmm]	W1=	331.4 [mm^3]	Sigo1=	387.7489 [MPa]
M2=	0 [Nmm]	W2=	0 [mm^3]	Sigo2=	0 [MPa]
T1=	1000 [N]	Wk=	662.8 [mm^3]	Sig Fo=	0 [MPa]
T2=	0 [N]	S=	66 [mm^2]	Tau1=	20.20152 [MPa]
Fo=	0 [N]	k1 smyk=	1.3333 [ ]	Tau2=	0 [MPa]
Mk=	138000 [Nmm]	k2 smyk=	1.3333 [ ]	Taukrut=	208.2076 [MPa]
		Sig red =	599.1929 [MPa]	K plastic =	1.27 [ ]
		Sig krit =	620 [MPa]		
		f=	1.034725 [ ]	**f=**	1.314101



Section check

Description Foot control – check of part 3 – tube 16/2

Load		*section geometry*		*Tension*	
M1=	77100 [Nmm]	W1=	274.5 [mm^3]	Sigo1=	280.8743 [MPa]
M2=	0 [Nmm]	W2=	0 [mm^3]	Sigo2=	0 [MPa]
T1=	600 [N]	Wk=	549 [mm^3]	Sig Fo=	0 [MPa]
T2=	0 [N]	S=	88 [mm^2]	Tau1=	9.090682 [MPa]
Fo=	0 [N]	k1 smyk=	1.3333 [ ]	Tau2=	0 [MPa]
Mk=	82800 [Nmm]	k2 smyk=	1.3333 [ ]	Taukrut=	150.8197 [MPa]
		Sig red =	425.6474 [MPa]	K plastic =	1.27 [ ]
		Sig krit =	620 [MPa]		
		f=	1.456605 [ ]	**f=**	1.849888



Section check

Description Foot control check – part 3 – version tube16/2

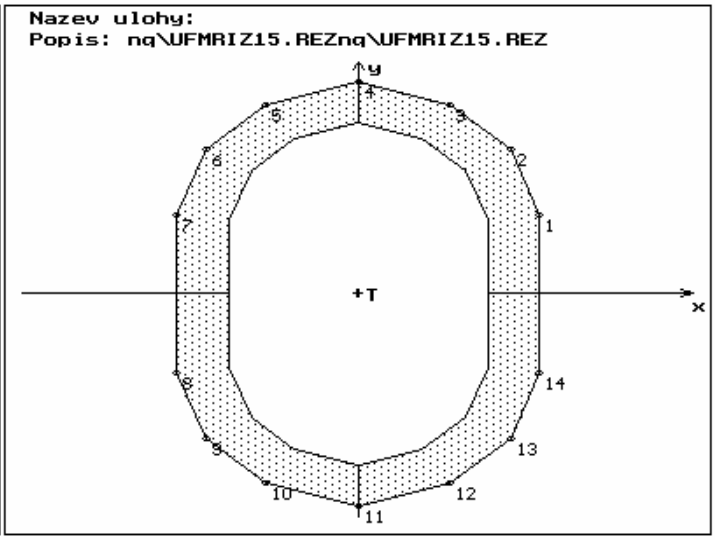
Load		*section geometry*		*Tension*	
M1=	57825 [Nmm]	W1=	274.5 [mm^3]	Sigo1=	210.6557 [MPa]
M2=	0 [Nmm]	W2=	0 [mm^3]	Sigo2=	0 [MPa]
T1=	1135.7 [N]	Wk=	549 [mm^3]	Sig Fo=	0 [MPa]
T2=	0 [N]	S=	88 [mm^2]	Tau1=	17.20715 [MPa]
Fo=	0 [N]	k1 smyk=	1.3333 [ ]	Tau2=	0 [MPa]
Mk=	62100 [Nmm]	k2 smyk=	1.3333 [ ]	Taukrut=	113.1148 [MPa]
		Sig red =	335.1284 [MPa]	K plastic =	1.27 [ ]
		Sig krit =	620 [MPa]		
		f=	1.850037 [ ]	**f=**	2.349547

Foot control - part 3 don´t comply witg requirements of regulation JAR-VLA (simultaneously act on both pedals at force 1000 N.

The last check is driving lever of cable, we check it on bend from critical force by simultaneous act both pilots in the same direction. Fcable =2070 N. Critical section is in distance 70 mm from axis of plug, Mo= 2070 *70 =144 900 Nmm.

The section creats the tube 16/2, which is deform into oblong with following charactreristic:

```
VYSLEDKY VYPOCTU

Celkova plocha prurezu:
   F: 105.22
 Souradnice teziste:
   XT:   0.0000
   YT:   0.0000
Momenty setrvacnosti:
  JXT: 4755.55
  JYT: 2412.67
 JXYT:   0.00
Hlavni osy setrvacnosti:
 Uhel sklonu:   0.00°
Hlavni momenty setrvacnosti
 JXOT: 4755.55
 JYOT: 2412.67
Prurezove moduly:
 WXT1: 430.21
 WXT2: 430.21
 WYT1: 344.67
 WYT2: 344.67
WXOT1: 430.21
WXOT2: 430.21
WYOT1: 344.67
WYOT2: 344.67
```



Section check

Description Driving lever of cable in foot control check UI-2

Load		*section geometry*		*Tension*	
M1=	144900 [Nmm]	W1=	430 [mm^3]	Sigo1=	336.9767 [MPa]
M2=	0 [Nmm]	W2=	0 [mm^3]	Sigo2=	0 [MPa]
T1=	2070 [N]	Wk=	549 [mm^3]	Sig Fo=	0 [MPa]
T2=	0 [N]	S=	88 [mm^2]	Tau1=	31.36285 [MPa]
Fo=	0 [N]	k1 smyk=	1.3333 [ ]	Tau2=	0 [MPa]
Mk=	0 [Nmm]	k2 smyk=	1.3333 [ ]	Taukrut=	0 [MPa]
		Sig red =	342.765 [MPa]	K plastic =	1.27 [ ]
		Sig krit =	620 [MPa]		
		f=	1.808819 [ ]	**f=**	2.297201

Conclusion: Whole assembly of foot control comply with the requirements of regulations UL-1, Bfu, P-ULL1 and after strenghening connection tube in the place of bearing of overhanging end even also of regulations JAR-VLA.

Check of control trace

1.1.4 Ceck of trace of elevator control.

We perform as decisive check of rods on the buckling strenght.

Rod 1 is created with screw of two rods, see drawings 11 3 891 and 11 3 881. The rods are distributed with three guides on four parts. We check part 1, where is on first end pivot joint and on second end guide.

Buckling	
Tow bar 113 891 Part 1 Tube16/1	
l=	575
k=	1
J1=	1331
E1=	72000
J2=	0
E2=	0
Fkrit=	2860.715097
Ftlak.=	-1423
f=	2.010340897 comply

Next control we perform between guide 2 and 3 in the place with screw. In consequence of trace characteristic we give buckling coefficient 2, because form of lodgement is between pivot joint and fix.

Buckling	
Tow bar113 891 part 3 Tube16/1	
l=	1100
k=	2
J1=	1331
E1=	72000
J2=	0
E2=	0
Fkrit=	1563.345337
Ftlak.=	-854
f=	1.830615149 comply

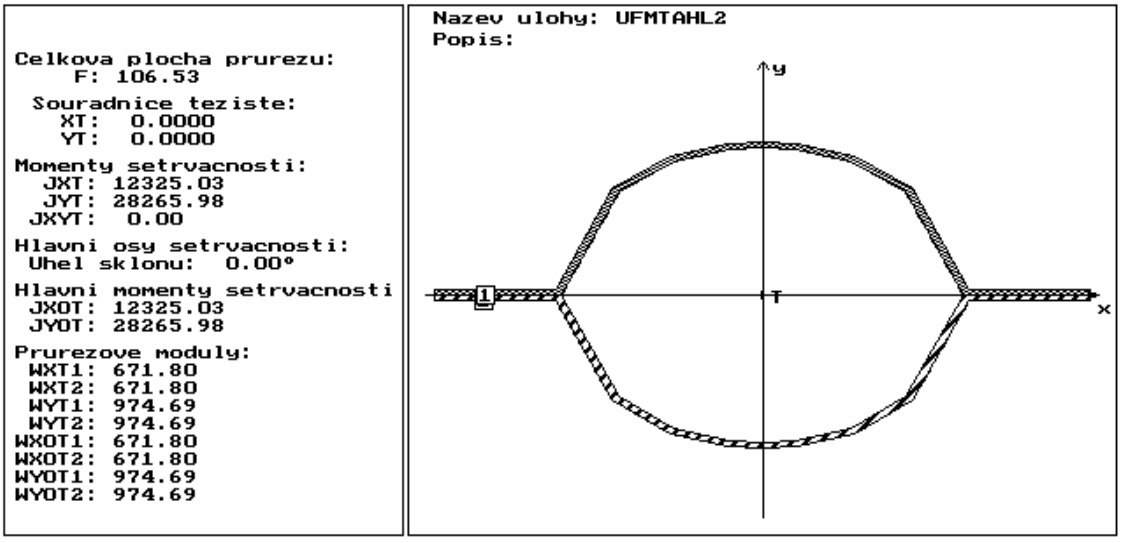
With forces of regulations UL-2 and german this part of trace comply
Next check of dimension this part is perform on force according JAR-VLA and P-ULL-1

Buckling		
Tow bar113 891 part 3 tube16/1		
l=	1100	
k=	2	
J1=	1331	
E1=	72000	
J2=	0	
E2=	0	
Fkrit=	1563.345337	
Ftlak.=	-1423	
f=	1.098626379	Don´t comply

Here the rod don´t comply

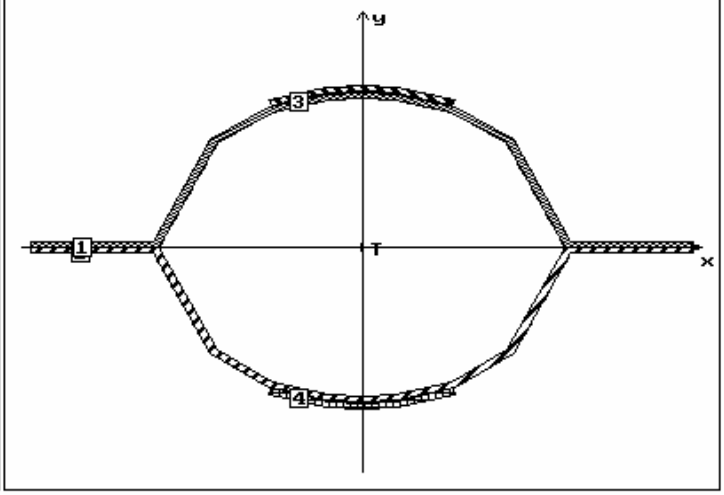
In the part 4 has the rod else laminated disguise for increase of consistence, see drawing 11 3 881.

This thickness has else in the middle thickness in lenght 800 mm. It is so rod with disguise with flexible consistence. For calculation we perform reduction on one equivalent of inertia moment according tab. and diagrams from „Radomski: Knickstabe mit sprungweise randerlichem Tragheitsmoment luftfahrforschung.“ Here Jm = $\gamma^2 \cdot \frac{J1+J2}{2}$, and γ is from diagram , value J1 and J2 for different part laminated diguise are find out with calculation.



```
Celkova plocha prurezu:
     F: 129.27
 Souradnice teziste:
    XT:   0.0000
    YT:   0.0000
Momenty setrvacnosti:
   JXT: 19828.49
   JYT: 28757.44
  JXYT:   0.00
Hlavni osy setrvacnosti:
 Uhel sklonu:  0.00°
Hlavni momenty setrvacnosti
 JXOT: 19828.49
 JYOT: 28757.44
Prurezove moduly:
 WXT1: 1033.21
 WXT2: 1033.21
 WYT1: 991.64
 WYT2: 991.64
WXOT1: 1033.21
WXOT2: 1033.21
WYOT1: 991.64
WYOT2: 991.64
```

Nazev ulohy: UFMTAHLO
Popis:

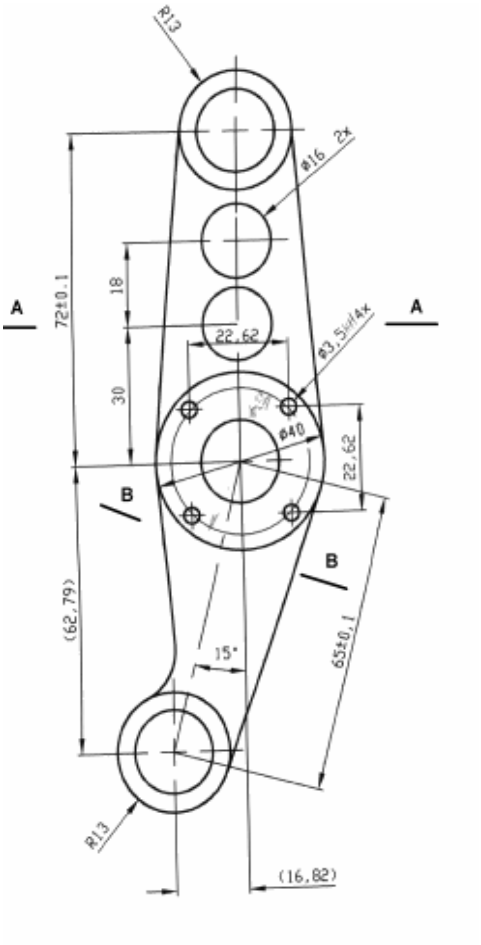


buckling			
Rod 113 881 part 4 tube16/1+ laminated diguise			
l=	2000	q=	0.766646969
k=	1	J1=	12325
J1=	1331	J2=	19828
E1=	72000	Jm	16076.5
J2=	16076.5	gama	1
E2=	30000		
Fkrit=	1426.471196		
Ftlak.=	-1423		
f=	1.002439351 Don´t comply		

buckling			
Rod 113 881 part 4 Tube16/1+ laminated diguise			
l=	2000	q=	0.766646969
k=	1	J1=	12325
J1=	1331	J2=	19828
E1=	72000	Jm	16076.5
J2=	16076.5	gama	1
E2=	30000		
Fkrit=	1426.471196		
Ftlak.=	-854		
f=	1.670340979 comply		

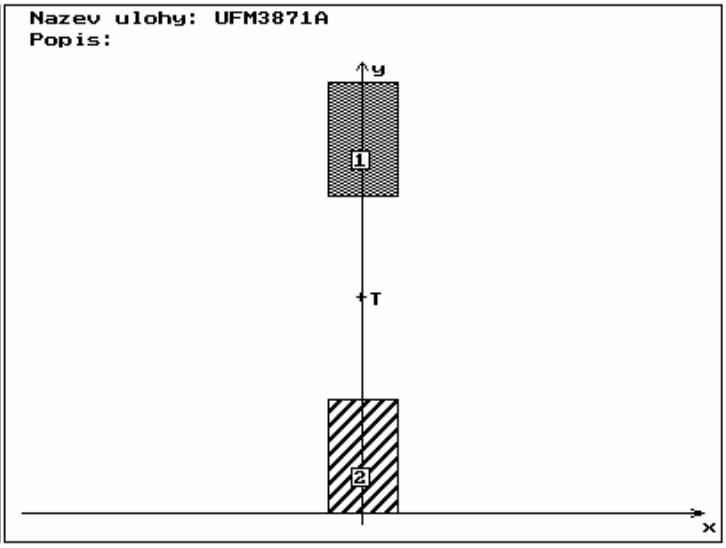
Rod don´t comply with P-ULL1 and JAR-VLA.

The next element of control line is lever of transfer between rod 1 and rod 2, drawing 11 3 871. For the indication of dimension and places of checked sections serves the following fig.:



The check we perform in sections A and B, next check we perform on the upper and bottom eye of lever. The section A-A has the following characteristic:

```
Celkova plocha prurezu:
     F: 72.00
 Souradnice teziste:
   XT:   0.0000
   YT: 17.0000
Momenty setrvacnosti:
  JXT: 11736.00
  JYT: 96.00
 JXYT:  0.00
Hlavni osy setrvacnosti:
 Uhel sklonu:  0.00°
Hlavni momenty setrvacnosti
 JXOT: 11736.00
 JYOT: 96.00
Prurezove moduly:
 WXT1: 690.35
 WXT2: 690.35
 WYT1: 48.00
 WYT2: 48.00
WXOT1: 690.35
WXOT2: 690.35
WYOT1: 48.00
WYOT2: 48.00
```

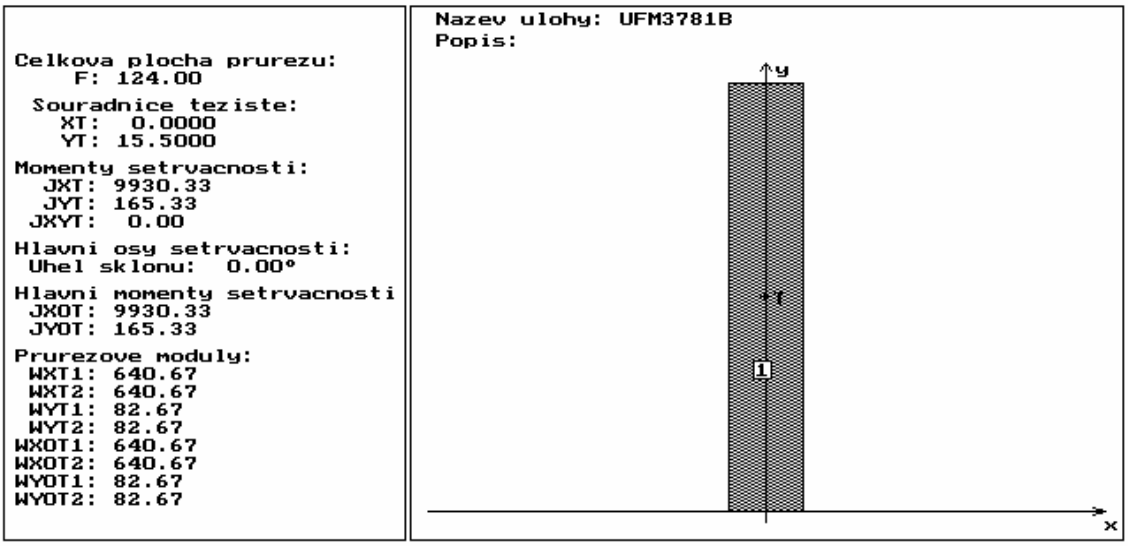


Check of section

Describtion Check of section A-A of lever 11 3 871

Load		*Section geometry*		*Tension*	
M1=	58266.6 [Nmm]	W1=	690.35 [mm^3]	Sigo1=	84.40154 [MPa]
M2=	0 [Nmm]	W2=	0 [mm^3]	Sigo2=	0 [MPa]
T1=	1387.3 [N]	Wk=	0 [mm^3]	Sig Fo=	4.448333 [MPa]
T2=	0 [N]	S=	72 [mm^2]	Tau1=	25.6901 [MPa]
Fo=	320.28 [N]	k1 smyk=	1.3333 [ ]	Tau2=	0 [MPa]
Mk=	0 [Nmm]	k2 smyk=	1.3333 [ ]	Taukrut=	0 [MPa]
		Sig red =	102.6364 [MPa]		
		Sig krit =	420 [MPa]		
		f=	4.092117 [ ]		

Section B-B has the following characteristic:



Check of section

Description Check of section B-B of lever 11 3 871

Load		*Section geometry*		*Tension*	
M1=	76061 [Nmm]	W1=	640 [mm^3]	Sigo1=	118.8453 [MPa]
M2=	0 [Nmm]	W2=	0 [mm^3]	Sigo2=	0 [MPa]
T1=	1690.25 [N]	Wk=	0 [mm^3]	Sig Fo=	18.08871 [MPa]
T2=	0 [N]	S=	124 [mm^2]	Tau1=	18.17428 [MPa]
Fo=	2243 [N]	k1 smyk=	1.3333 [ ]	Tau2=	0 [MPa]
Mk=	0 [Nmm]	k2 smyk=	1.3333 [ ]	Taukrut=	0 [MPa]
		Sig red =	141.6762 [MPa]		
		Sig krit =	620 [MPa]		
		f=	4.376176 [ ]		

Check of upper eye of lever.

VSTUPNI DATA

UFM3871H

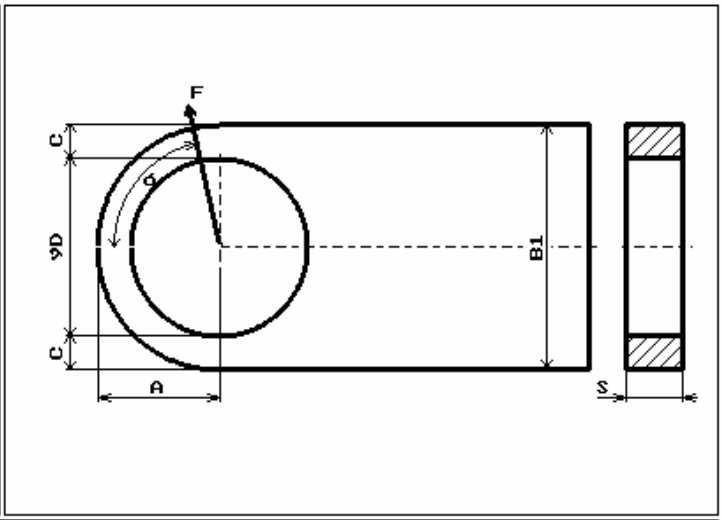
horni oko 11-3-871

Pevnost mat.[MPa]:	420.00
Mez kluzu...[MPa]:	280.00
Tahová síla F [N]:	1423.8
ó [°]:	77.00
Tlak. síla Fd [N]:	1285.6
D [mm]:	19.00
C [mm]:	3.50
A [mm]:	13.00
B1[mm]:	26.00
S [mm]:	6.00

Ulození: 7=>H7;8=>H8;9=>oko tvori vnejsi krouzek loz: 9

Vliv nepresne vyr.-F3: 1.00

Vliv druhu zat. -F4: 0.60



I. KONTROLA OKA S OHLEDEM NA PEVNOST:

1. utrzeni oka: σ = 40.68 MPa
σpt = 420.00 MPa
Nadjistota = 10.32

2. roztrzeni oka a vysmeknuti cepu:
σotl. = 12.49 MPa
σotl.dov. = 116.05 MPa
Nadjistota = 9.29

3. Otlaceni oka (pro cisty tlak):
σotl. = 11.28 MPa
σotl.dov. = 1157.21 MPa
Nadjistota = 102.62

II. KONTROLA OKA S OHLEDEM NA DEFORMACI

1. utrzeni oka: σ = 33.90 MPa
σpt = 129.31 MPa
Nadjistota = 3.81

2. roztrzeni oka a vysmeknuti cepu:
σotl. = 12.49 MPa
σotl.dov. = 49.42 MPa
Nadjistota = 3.96

3. Otlaceni oka (pro cisty tlak):
σotl. = 11.28 MPa
σotl.dov. = 225.29 MPa
Nadjistota = 19.98

Ceck of bottom eye of lever.

VSTUPNI DATA

UFM37810

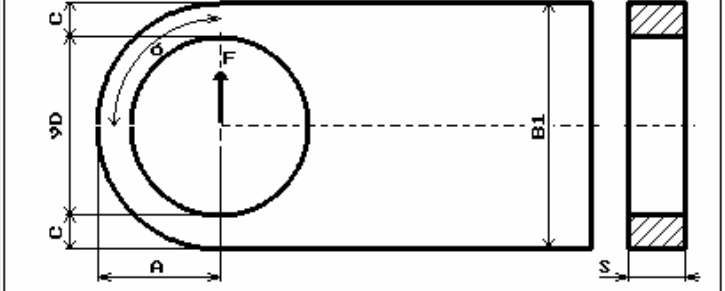
spodni oko 11 3 871

Pevnost mat.[MPa]:	420.00
Mez kluzu...[MPa]:	280.00
Tahová síla F [N]:	1087.0
ó [°]:	90.00
Tlak. síla Fd [N]:	2808.6
D [mm]:	19.00
C [mm]:	3.50
A [mm]:	13.00
B1[mm]:	26.00
S [mm]:	6.00

Ulození: 7=>H7;8=>H8;9=>oko tvori vnejsi krouzek loz: 9

Vliv nepresne vyr.-F3: 1.00

Vliv druhu zat. -F4: 0.60



I. KONTROLA OKA S OHLEDEM NA PEVNOST:

1. utrzeni oka: σ = 31.06 MPa
σpt = 420.00 MPa
Nadjistota = 13.52

2. roztrzeni oka a vysmeknuti cepu:
σotl. = 9.54 MPa
σotl.dov. = 116.05 MPa
Nadjistota = 12.17

3. Otlaceni oka (pro cisty tlak):
σotl. = 24.64 MPa
σotl.dov. = 1157.21 MPa
Nadjistota = 46.97

II. KONTROLA OKA S OHLEDEM NA DEFORMACI

1. utrzeni oka: σ = 25.88 MPa
σpt = 127.27 MPa
Nadjistota = 4.92

2. roztrzeni oka a vysmeknuti cepu:
σotl. = 9.54 MPa
σotl.dov. = 48.64 MPa
Nadjistota = 5.10

3. Otlaceni oka (pro cisty tlak):
σotl. = 24.64 MPa
σotl.dov. = 221.73 MPa
Nadjistota = 9.00

From performed checks the most loaded lever of all control line we can see the overdimension (minimal coeficient of safety f=3,8), it is given of the bearings width, which are used in the control line. The other levers are designet similar and have lower loads, this is why we don´t calculate their stability.

Rod 2 is for the mater balancing designed as steel rod.(drawing 11 3 831)

Buckling	
Rod113 831 rod16	
l=	1159
k=	1
J1=	3216
E1=	210000
J2=	0
E2=	0
Fkrit=	4962.130804
Ftlak.=	-1087
f=	4.56497774 suit

Conclusion: Elevator control system comply with requirements of regulationsUL-2 and Bfu.

Rod 1 (drawings 11 3881, 11 3 891) don´t comply with JAR -VLA and P-ULL1, the rest of control line comply with them..

1.1.5 Check aileron and flapperon control system.

We perform the check of rods on buckling strength, both ailerons control line in the fuselage are the same.

Rod 1, the short rod from control sticks to first transfer lever.

Buckling	
rod11 3 681 tube12/1	
l=	162
k=	1
J1=	528
E1=	72000
J2=	0
E2=	0
Fkrit=	14296.7109
Ftlak.=	-448
f=	31.91230112 comply

Rod 2 is from two pieces, cennected with an swinged element on the countershaft.

Buckling	
Rod 11 3 661 part 1 Tube12/1	
l=	370
k=	1
J1=	528
E1=	72000
J2=	0
E2=	0
Fkrit=	2740.707676
Ftlak.=	-1056.60352
f=	2.593884673 comply

Buckling	
Rod 11 3 631 part 2 Tube12/1	
l=	510
k=	1
J1=	528
E1=	72000
J2=	0
E2=	0
Fkrit=	1442.533183
Ftlak.=	-1056.60352
f=	1.365254947 Don´t comply

Buckling	
Rod 11 3 631 part 2 tube12/1	
l=	510
k=	1
J1=	528
E1=	72000
J2=	0
E2=	0
Fkrit=	1442.533183
Ftlak.=	-475.471584
f=	3.033899883 comply

The rod 3 is first rod in the wing UFM-11. Following check of sekcion of laminated rod answers the section, which was introduced by elevator controls rod, only the strengthten with carbon roving has lenght 1000 mm..

Buckling			
Rod 12 5 311 Laminated rod			
l=	2500	q=	0.766647
k=	1	J1=	12325
J1=	0	J2=	19828
E1=	0	Jm	16076.5
J2=	16076.5	gama	1
E2=	30000		
Fkrit=	761.6097		
Ftlak.=	-586.415		
f=	1.298756 Don´t comply		

Buckling			
Rod 12 5 311 Aminated rod			
l=	2500	q=	0.766647
k=	1	J1=	12325
J1=	0	J2=	19828
E1=	0	Jm	16076.5
J2=	16076.5	gama	1
E2=	30000		
Fkrit=	761.6097		
Ftlak.=	-263.887		
f=	2.886124 comply		

Rod 3 for UFM-13 has different length and is designed from dural tube with disguise, the check is following:

Buckling			
Rod 13 5 311 Tube 16/1			
l=	1465	q=	0.814815
k=	1	J1=	1331
J1=	1633.5	J2=	1936
E1=	72000	Jm	1633.5
J2=	0	gama	1
E2=	0		
Fkrit=	540.8491		
Ftlak.=	-586.415		
f=	0.922298 Don´t comply		

Buckling			
Rod 13 5 311 Tube 16/1			
l=	1465	q=	0.814815
k=	1	J1=	1331
J1=	1633.5	J2=	1936
E1=	72000	Jm	1633.5
J2=	0	gama	1
E2=	0		
Fkrit=	540.8491		
Ftlak.=	-263.887		
f=	2.04955 comply		

Check of the rod 4 for its short length is not necessery for UFM-11 and UFM-13 to do.

Aileron and flapperon control trace comply with requirements of regulation UL-2 and Bfu.

Rod 2 (drawing 11 3 6311) and rod 3 (drawing 12 5 311,13 5 311) don´t comply with requirements of regulations Jar-VLA and P-ULL1, the rest of control tace comply with them.

1.1.6 Chesk of flaps and air brakes control systems.

We perform the check of flaps control system UFM-11 on the load from negative hinge moment by negative position of flaps, this load is very near to realistic case. The check of air brakes control system UFM-13 will be proved with an test, no aritmetical.

Rod 1 leads from flaps countershaft aslant upwards in the fuselage to the automatic connector fuselage - wing

Buckling	
Rod 11 3 631 Tube 12/1	
l=	510
k=	1
J1=	528
E1=	72000
J2=	0
E2=	0
Fkrit=	1442.533
Ftlak.=	-263.9
f=	5.466206 comply

Rod 2 is the first rod of flaps control system in the wing.

Buckling	
Rod 12 5 221 Tube 16/1	
l=	950
k=	1
J1=	1331
E1=	72000
J2=	0
E2=	0
Fkrit=	1048.004
Ftlak.=	-146.465
f=	7.15534 comply

Whole trace of flaps control system comply with requirements of regulations UL-2, Bfu, P-ULL1, JAR-VLA.

1.1.7 The check of rudder control trace.

Whole rudder control trace is created with the steel cable Dmr 3.15 mm with nominal strength 5730 N, max. force in the cable is by simultaneous act 75 % forces both pilots Fmax= 2070 N.

Factor of safety in the cable is f = 2,768

All trace of rudder control comply with requirements of regulations UL-2, Bfu, P-ULL1, JAR-VLA.

2. Conclusion.

All elements of control systems the airplanes UFM-11 a UFM-13 comply with requirements of regulation UL-2 and german regulation Bfu.

With regulitions JAR-VLA and P-ULL1 don´t comply following elements:

Pedals (drawing 11 3 551,11 3 571)

Rod 2 (drawing 11 3 6311) and rod 3 (drawing 12 5 311,13 5 311) in the trace aileron control and flapperon control.

Rod 1 (drawing 11 3881, 11 3 891) in the trace of elevator control.