ОТЧЕТ ПО ПРОИЗВОДСТВЕННОЙ ПРАКТИКЕ

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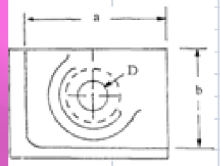
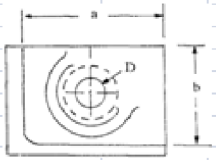
группа 3-33

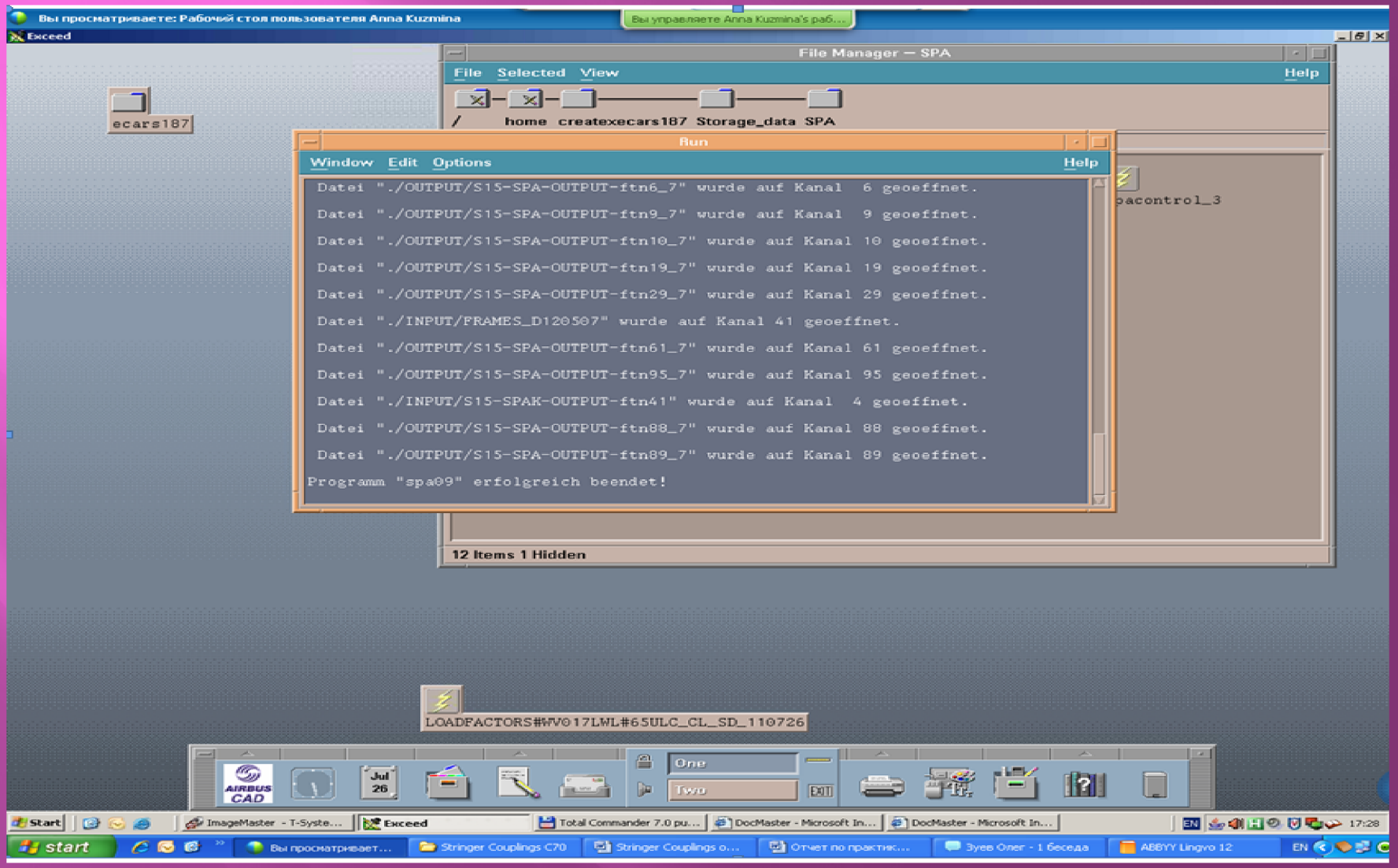
Во время прохождения практики, нам было предложено принять участие в проекте по расчету частей самолета Airbus A319.В процессе был выполнен расчет в среде ASSACOS, обработка результатов и подготовка отчетов для заказчика.

Обобщены и выведены наименьшие Reserve Factor в Stringer Coupling

Bending Stresses				*Bending Stresses*			
$\sigma_{sx} = \frac{m_z}{I_x} \cdot y_{cg}$	in MPa:		133,64	$\sigma_{sx} = \frac{m_z}{I_x} \cdot y_{cg}$	in MPa:		103,00
$\sigma_{sy} = \frac{m_y}{I_y} \cdot (x_{cg} - t_{web})$	in MPa:		-6,24	$\sigma_{sy} = \frac{m_y}{I_y} \cdot (x_{cg} - t_{web})$	in MPa:		-8,41
Total stress in Point A				*Total stress in Point A*			
$\sigma_{total} = \sigma_{yi} + \sigma_{sx} + \sigma_{sy}$	in MPa:		202,66	$\sigma_{total} = \sigma_{yi} + \sigma_{sx} + \sigma_{sy}$	in MPa:		155,81
Reserve Factor				***Reserve Factor***			
$RF = \frac{R_m}{\lambda \cdot \sigma_{total}}$			1,68	$RF = \frac{R_m}{\lambda \cdot \sigma_{total}}$			2,19
with λ as fitting factor acc. to Ref. 2			1,38	with λ as fitting factor acc. to Ref. 2			1,38
Endpad calculation				*Endpad calculation*			
	a in mm: $a = h_{cpl} - t_{GF}$ b in mm: $b = w_{cpl} - t_{Web}$		32,00 30,00		a in mm: $a = h_{cpl} - t_{GF}$ b in mm: $b = w_{cpl} - t_{Web}$		34,00 39,00
	with a/b:		1,07		with a/b:		1,15
	The k_s - factor acc. Ref. 3, p. 349 is:		1,35		The k_s - factor acc. Ref. 3, p. 349 is:		1,40
applied bending stress: σ_{EP} in MPa	$\sigma_{EP} = \frac{k_s \cdot P_{tension,z}}{t_e^2}$		461,54	applied bending stress: σ_{EP} in MPa	$\sigma_{EP} = \frac{k_s \cdot P_{tension,z}}{t_e^2}$		478,64
Reserve Factor				***Reserve Factor***			
$RF = \frac{R_{0.2\%-1.5}}{\lambda \cdot \sigma_{EP}}$			1,10	$RF = \frac{R_{0.2\%-1.5}}{\lambda \cdot \sigma_{EP}}$			1,06
with λ as fitting factor acc. to Ref. 2			1,38	with λ as fitting factor acc. to Ref. 2			1,38
Calculation of the rivetting							
Bolt: NSA5031-4-12 acc. to D533-76035							
R_m in MPa:			1078,70				
A in mm²:	d = 7,912	mm	49,17				
$F_{allowable}$ in N:			53035,07				
RF:	$RF = \frac{F_{allowable}}{P_{tension,z}}$		3,17				

C	D	E	F	G	H	I	J
	Total stress in Point A	*Endpad calculation*	*Calculation of the rivetting*	2.1 Tension	2.2 Compression		
P39 RF	4,80	2,09	5,39	2,73	1,67		
P'39 RF	4,78	2,08	5,37	2,72	1,69		
P40 RF	3,20	1,39	3,60	3,04	2,44		
P'40 RF	2,66	1,16	2,99	2,52	1,28		
P41 RF	1,74	1,95	2,41	7,87	6,58		
P'41 RF	1,94	1,94	2,40	7,83	6,60		
P42 RF	1,69	1,10	3,18			2,19	1,06
P'42 RF	1,68	1,10	3,17			2,19	1,06
P43 RF	4,16	1,64	4,73			6,21	1,64
P'43 RF	4,15	1,64	4,72			6,21	1,64
P44 RF	3,93	1,55	4,47			5,88	1,55

Выполнен расчет в среде ASSACOS



После обработки данные вносились в отчет, и производился ручной расчет отдельных частей самолета на устойчивость, срез и др. Мной бы сделана 7 глава: Detailed hand calculation of Calculation of Stringer Coupling C34-C35.

7 Detailed hand calculation of Calculation of Stringer Coupling C34-C35

7.1 Calculation of Stringer Coupling C34-C35 Section 15 / P'42

Oveview Sketch

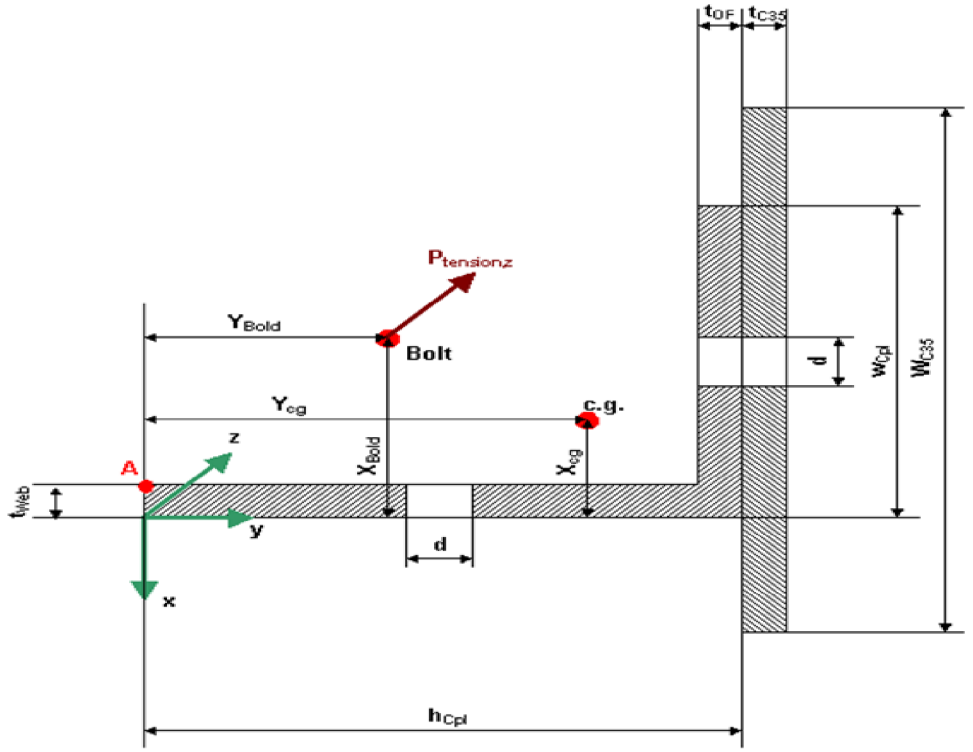


Figure 5.1-1: Analysed cross sections of frame support P3/P'3 and representation in FE model

References

1. Lockheed stress memo 53d
2. Lockheed stress memo 88a
3. Niu, Airframe Stress Analysis and Sizing, Chapter 9
4. Skin Data: D533-70665
5. Coupling Data: D533-70506
6. Stringer Data: D533-70655
7. Angle: D533-70802

Note: The maximum stress occurs in point A!

Geometrical Data

height of coupling: h_{Cpi} in mm		39.00
width of coupling: w_{Cpi} in mm		42.00
thickness of web: t_{web} in mm		3.00
thickness of outer flange: t_{OF} in mm		5.00
rivet diameter: **d** in mm		4.80
thickness of angle: t_{C35} in mm		2.50
width of angle: $w_{C35} = 30 \cdot t_{C35}$ in mm		75.00
thickness of skin: t_{skin} in mm		3.00
width of skin: w_{skin} in mm (stringer pitch)		127.37
crossection of skin: A_{skin} in mm²		382.11
Thickness of endpad: t_e in mm		7.00
Net crossection of coupling: A_n in mm²		273.60
y-distance center of gravity: y_{cg} in mm		30.13
x-distance center of gravity: x_{cg} in mm		14.63
Inertia y-achsis: I_y in mm^4		147524.00
Inertia x-achsis: I_x in mm^4		44743.00
y-distance Bold: y_{Bold} in mm		19.50
x-distance Bold: x_{Bold} in mm		21.00
crossection of stringer: $A_{stringer}$ in mm²		354.00

Loads:

Maximum tension: $P_{tension}$ in N (Skin+Stringer)	26XHB312	69670

Maximum compression: $P_{compression}$ in N (Skin+Stringer) 26MVA302 -72938

Allowables

plastic bending stress allowable: $R_{b@k=1.5}$ in MPa (acc. to Ref. 1, Fig. 21, k = 1.5) 700.00

ultimate tension stress: R_m in MPa (acc. to ASNA3050) 470.00

Recalculation of the FE-Loads in Stringer-Loads

$$P_{tension,z} = 0.5 \cdot P_{tension} \cdot \frac{A_{Stringer}}{A_{Stringer} + A_{Skin}} = 0.5 \cdot 69670 \cdot \frac{354}{354 + 382.11} = 16752.37$$

Normal stress

$$\sigma_N = \frac{P_{tension,z}}{A_n} = \frac{1675237}{273.60} = 61.23$$

Bending moments

$$m_x = P_{tension,z}(y_{eg} - y_{Bolt}) = 1675237 \cdot (30.13 - 19.50) = 152949.17$$

$$m_y = -P_{tension,z}(x_{Bolt} - x_{eg}) = -1675237 \cdot (21 - 14.63) = -106712.6$$

Bending Stresses

$$\sigma_{bx} = \frac{m_x}{I_x} \cdot y_{eg} = \frac{m_x}{44743.00} \cdot 30.13 = 103.00$$

$$\sigma_{by} = \frac{m_y}{I_y} \cdot (x_{eg} - t_{web}) = \frac{m_x}{147524.00} \cdot (14.63 - 3) = -8.41$$

Total stress in Point A

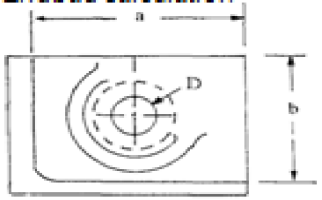
$$\sigma_{total} = \sigma_N + \sigma_{bx} + \sigma_{by} = 61.23 + \sigma_{bx} + \sigma_{by} = 155.81$$

Reserve Factor

$$RF = \frac{R_m}{\lambda \cdot \sigma_{total}} = \frac{470.00}{\lambda \cdot \sigma_{total}} = 2.19$$

with as fitting factor acc. to Ref. 2 1.38

Endpad calculation



a in mm: 34.00
b in mm: 39.00

with a/b: 1.15

The ka - factor acc. Ref. 3, p. 349 is: 1.40

Во время работы над проектами я получил уникальный опыт работы. Каждый из нас занимался своим делом, необходимым для продвижения проекта. Я был частью одной команды. Я смог применить теоретические знания, полученные из профильных предметов по назначению.

Работа в Прогресстех-Дубна – это ответственный, ёмкий труд, требующий знаний