TEXIGLASS

TECIDOS DE FIBRA

VIDRO • CARBONO • ARAMIDA

Presença da TEXIGLASS no mundo

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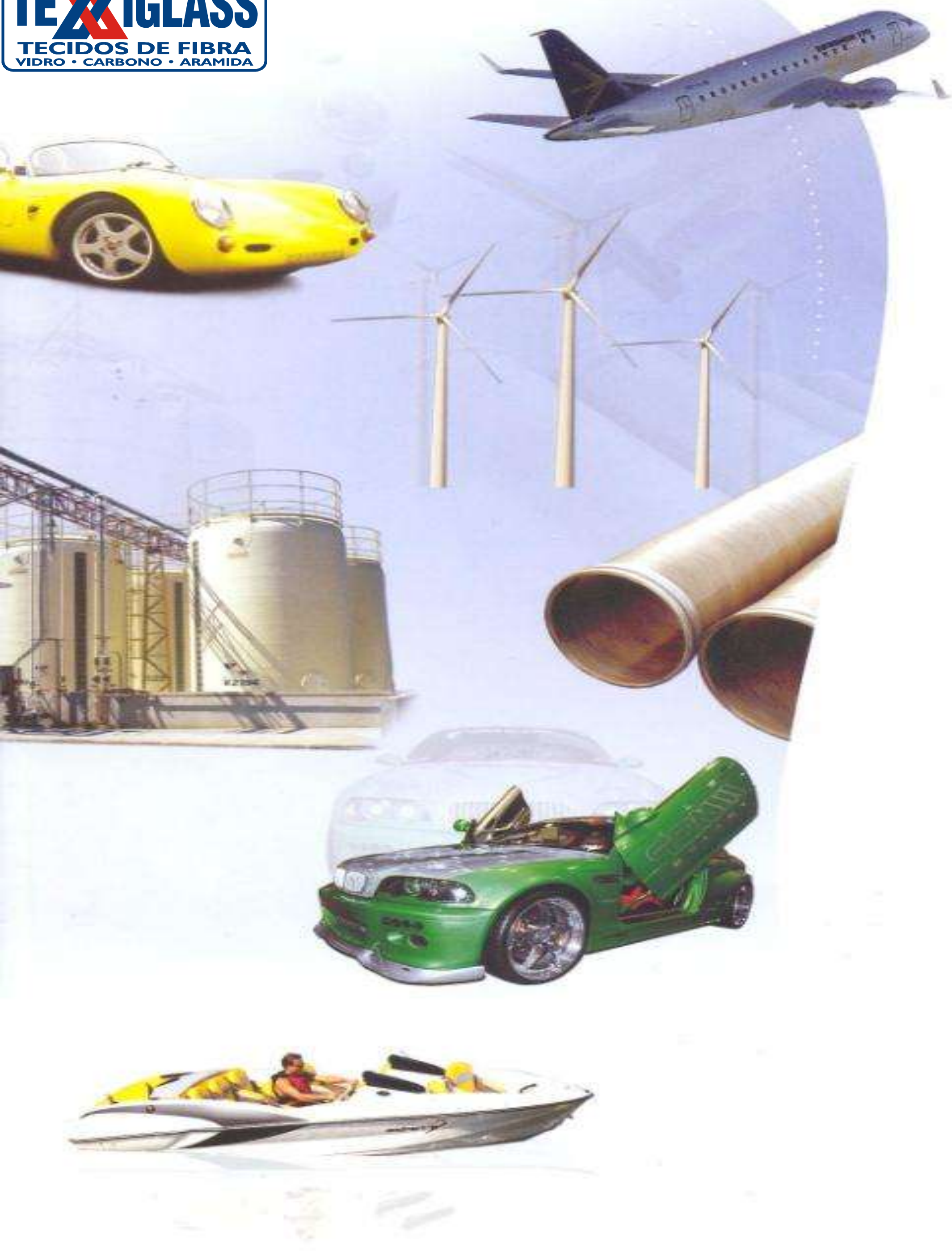

Fios dos Tecidos

Os fios podem ser de:

- Fibra de Vidro
- Fibra de Carbono
- Fibra Aramida (Kevlar ou Twaron)
- Outras Fibras

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Tecido de Fibra de Vidro

Tecido de Fibra de Carbono CCS-200

Fibra de Carbono = fio acrílico carbonizado

Tecido de Fibra Aramida KK-205

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Tecido Híbrido Carbono + Aramida CKS-200

Material	Densidade (g/cm³)	Mód. de Elast. E (GPa)	Resist. à Tração (MPa)
Aço 1010	7,87	207	365
Alumínio 6061	2,70	69	310
Compósito Carbono+Epoxi	1,50	138	1550
Compósito Aramida+Epóxi	1,29	76	1378
Compósito Vidro E+Epóxi	2,00	39	965

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Quanto Maior o Conteúdo de Carbono, Maior é o Módulo de Elasticidade (E)

Tipo	Densidade g/cm³	Módulo (E) GPa
Standard Módulo	1,76	228
Alto Módulo	1,90	400
Ultra-Alto Módulo	1,86	517

- Por que usar TECIDOS?

- Usam-se tecidos por várias razões:

Com tecidos obtém-se

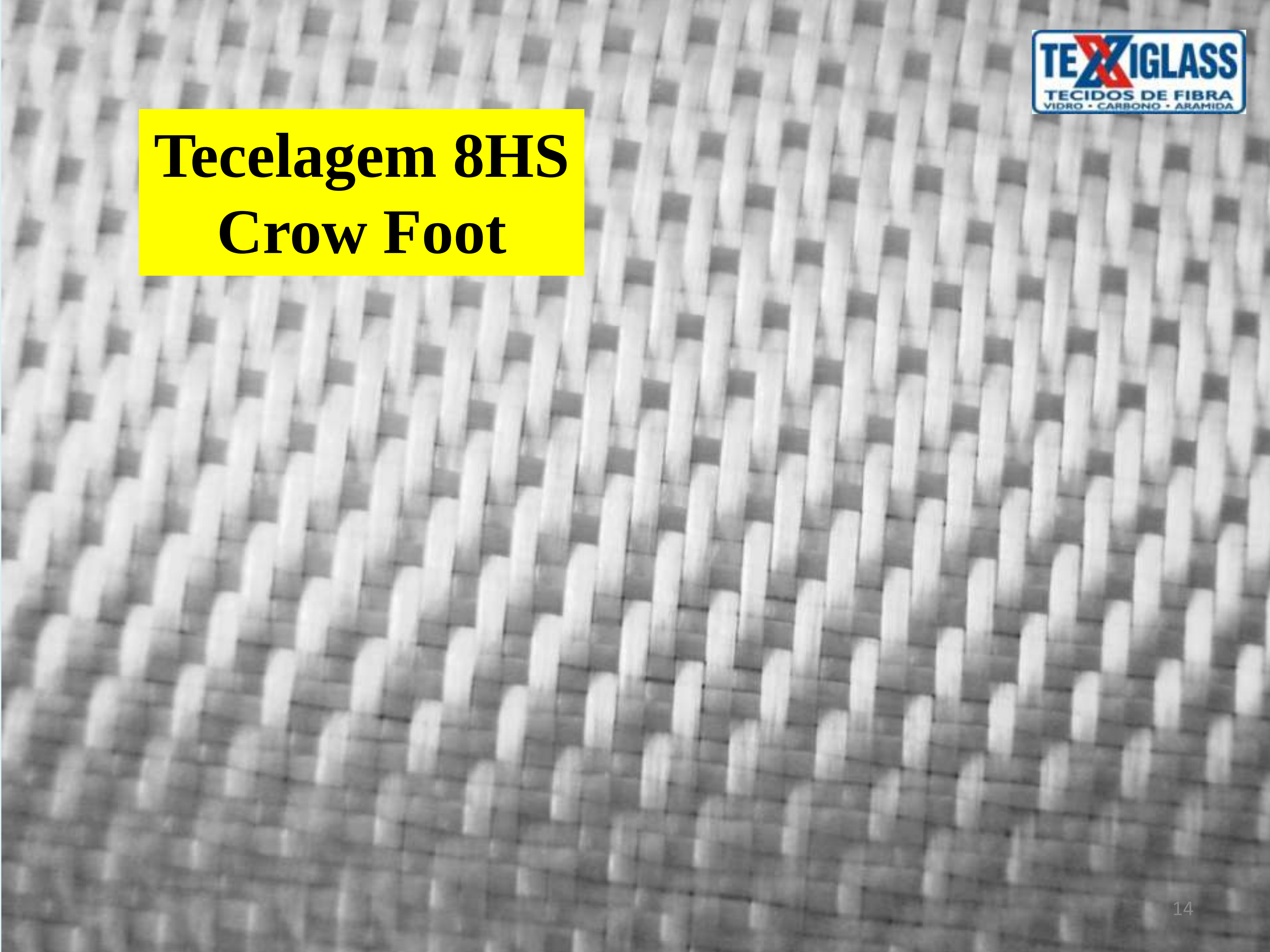
1 – Estabilidade dimensional.

2 – Garantia de uniformidade na espessura.

3 – Cálculos precisos de resistência mecânica. (maior segurança)

4 – Redução de peso.

Tecelagem 8HS
Crow Foot



50% de Composites	20% de redução de peso

Menor Peso	Maior Autonomia
	Maior Capacidade de carga
	Menor Poluição

1 Kg a menos de peso	2 m a menos de pista

Futuro das Aeronaves

No futuro, a preocupação ambiental será o grande desafio.

A próxima geração de aeronaves deverá ter mais compósitos na fuselagem.

Maior eficiência em consumo de combustível.

Meta: Consumo equivalente a 30% do atual (ou seja, 70% mais econômicas).

Aeronaves "amigas da natureza".

Por que?

O tráfego aéreo deverá dobrar até 2020 e triplicar até 2050.

Como os custos da aviação quadruplicaram desde 1990, a eficiência será o grande trunfo.

E isso só conseguiremos com os compósitos, que proporcionam liberdade de design e total inovação na fuselagem das aeronaves.

Há os exemplos da AIRBUS e da BOEING, entre outras.

Por que compósitos?

'WE LOST THE CABIN'

BY CLIVE IRVING

At 10:56 p.m. on April 1 last year, Southwest Airlines Flight 812, en route from Phoenix to Sacramento with 118 passengers aboard, was completing its climb to its cruise altitude of 36,000 feet. An air-traffic controller at Los Angeles Center had just acknowledged a routine call from the pilot. But within a minute or so the controller became aware that Flight 812 was in some kind of trouble. The messages were garbled until, finally, he heard the pilot clearly: *"...declaring an emergency we lost the cabin."*

Shawna Malvini Redden, a 29-year-old doctoral student at Arizona State, had just settled into a window seat in row 8 when there was an ear-splitting bang. Oxygen masks dropped from the ceiling and the airplane pitched forward.

The Los Angeles controller asked the pilot to repeat the message. *"Request an emergency descent we've lost the cabin and we're starting down."*

"We lost the cabin" meant that the airplane had suffered a sudden and extreme loss of cabin pressure. The pilots had two urgent priorities—to get to a lower altitude and to find an airport for an emergency landing.

As a blast of air rushed through the cabin, Malvini Redden felt reassured by the flight attendants' composure. But she reached over to the man in the aisle seat and took his hand. "If I'm going to go down," she thought, "at least I want to feel connected to somebody."

Flight 812 touched down safely a few minutes later in Yuma, Ariz., a hole 59 inches long and nine inches wide in the roof of the cabin. The skin of the airplane had peeled away. To inspectors from the National Transportation Safety Board, the structural failure must have seemed worryingly familiar: there had been a similar episode involving another Southwest airplane in July 2009; additionally, the airplane type involved, the Boeing 737, had a history of weaknesses in its fuselage skin. When the NTSB took the damaged part of the cabin roof from Flight 812 back to its labs in Washington, they found serious manufacturing flaws. Forty-two rivet holes at joints where the fuselage skin overlapped, called lap joints, were so far out of alignment that the lower holes had become oval, not round, causing fatigue cracks, and paint had leaked from the outer skin into the joints.

This specific plane had been delivered in 1996, a version of the 737 known as the Classics. Immediately after the Flight 812 emergency, Boeing's chief engineer for the series, Paul Richter, said that Boeing had anticipated some level of cracking in the relevant area, but not so soon in the plane's life cycle. And the CEO of Boeing Commercial Airplanes, W. James McNerney, asserted that the problem was poor manufacturing of one airplane, not a broader design issue.

The 737 Classics were supposed to have a safe service life of 60,000 flights. In fact, to meet that standard, they must be judged to be capable of flying twice that number. But the Southwest

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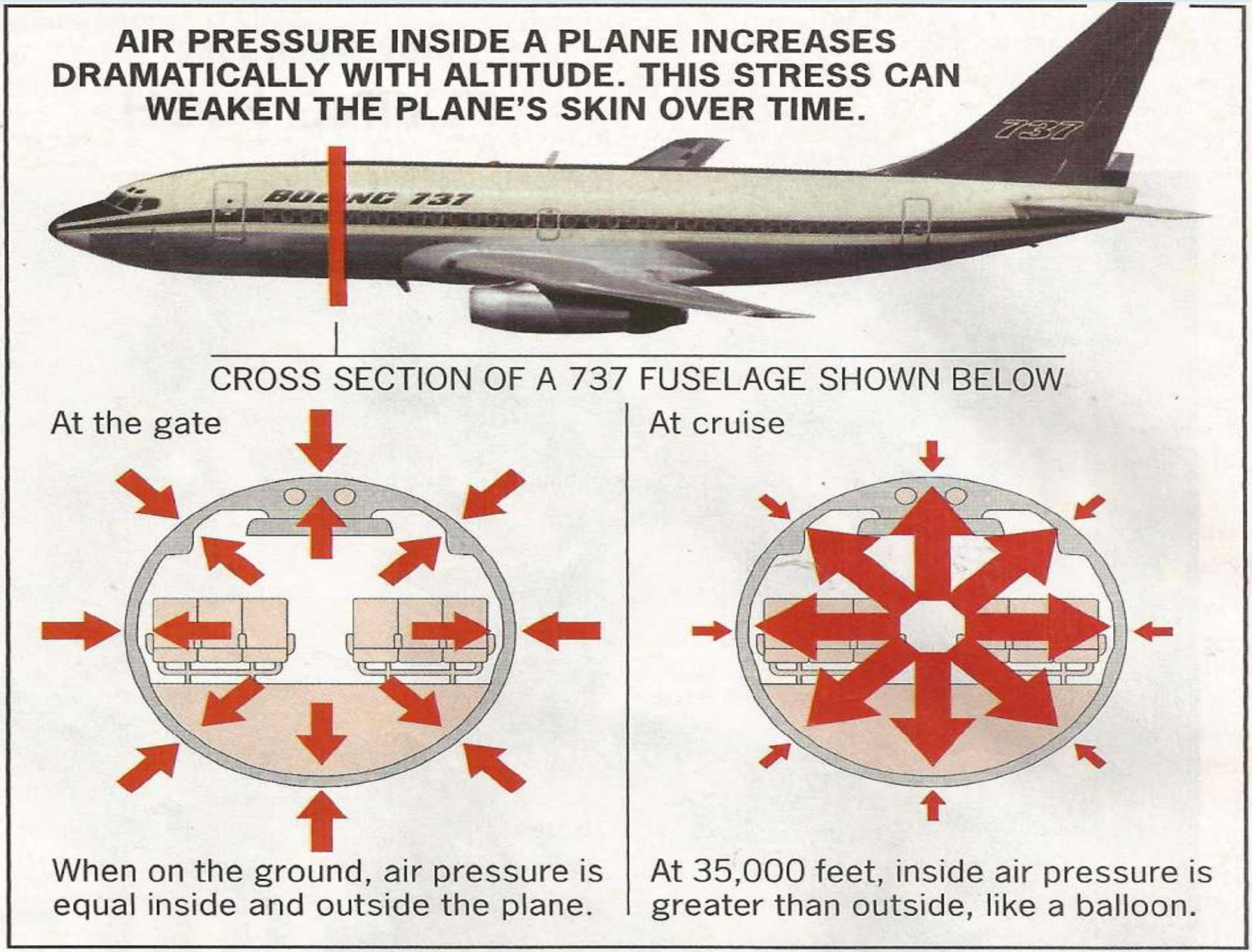
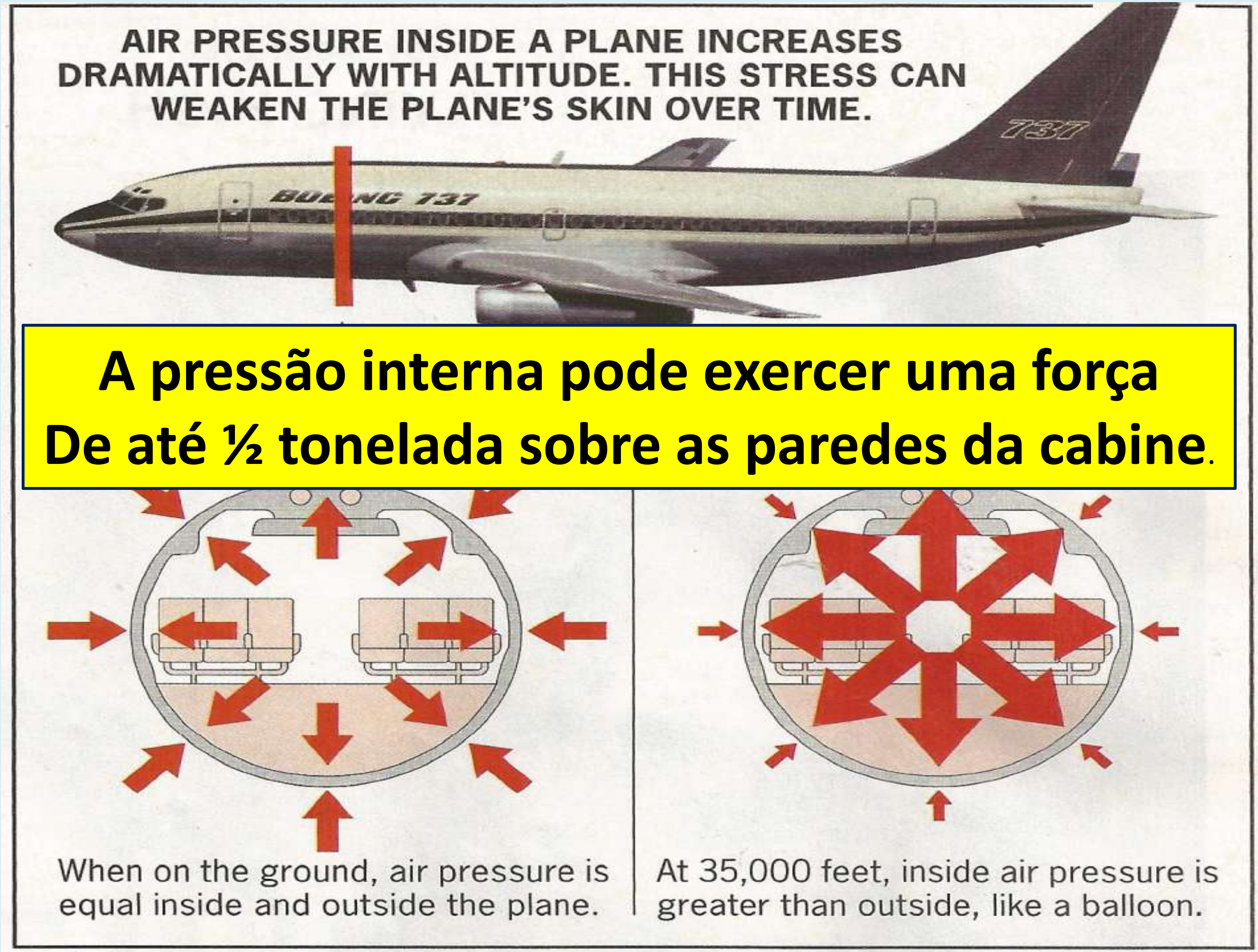
Despressurização da cabine

Por que isso ocorre? → Fadiga!!!


AIR PRESSURE INSIDE A PLANE INCREASES DRAMATICALLY WITH ALTITUDE. THIS STRESS CAN WEAKEN THE PLANE'S SKIN OVER TIME.
737
CROSS SECTION OF A 737 FUSELAGE SHOWN BELOW
At the gate
At cruise
When on the ground, air pressure is equal inside and outside the plane.
At 35,000 feet, inside air pressure is greater than outside, like a balloon.



A pressão interna pode exercer uma força
De até ½ tonelada sobre as paredes da cabine.

O metal é dúctil
A pressão interna da cabine estica as paredes da aeronave
Cada vez que a cabine é presssurizada, as paredes afinam.
As paredes da aeronave afinam constantemente.
Como o metal é dúctil, mas não elástico, ele não volta.
A cada ciclo, a fuselagem é submetida a intenso “stress”

A vida de uma aeronave não é medida em “anos” mas em “ciclos”

Os compósitos de fibra de carbono ou mesmo fibra de vidro,
como praticamente não esticam, sofrem muito menos “stress”.

From left: Richard Garcia—AFP-Getty Images, Robert Nichols—AP

Investigators said humid conditions weakened Aloha's 737 in 1988

Newsweek

Enorme diferença de tamanho entre o Boeing 737 e o 747
Só com Compósitos se pode chegar a esse resultado!

Especialmente para o 747-8 a GE desenvolveu uma turbina com **fibra de carbono**,
Com menor Nº de pás, mais silenciosa, mais econômica e muito **mais leve**.
180 Kg a menos por turbina => x 4 turbinas, são **10 passageiros a mais**!

EFICIÊNCIA!!!

A-380

Comprimento: 73m
Envergadura: 80m

Peso Vazio: 277 ton
Peso Máximo: 580 ton

Autonomia: 15.000 Km
Velocidade: 945 Km/h

460 passageiros

BOEING 747-8
Velocidade: 988 Km/h

Comprimento: 76m
Envergadura: 68m

Peso máximo: 397 ton
Autonomia: 15.000 Km

Radome do Air-Bus A-320
Oficina da TAM em São Carlos - SP

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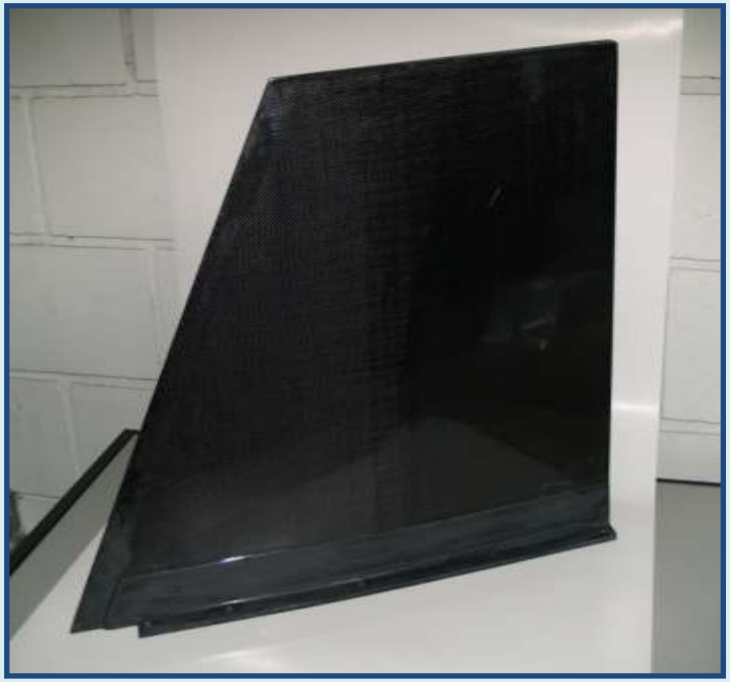
Peças para Avião Executivo

Laminação de Fibra de carbono pré-impregnada com resina epóxi.

Produto final após cura em autoclave.

Produtos



Aeroespacial


PARE

Obrigado pela atenção

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