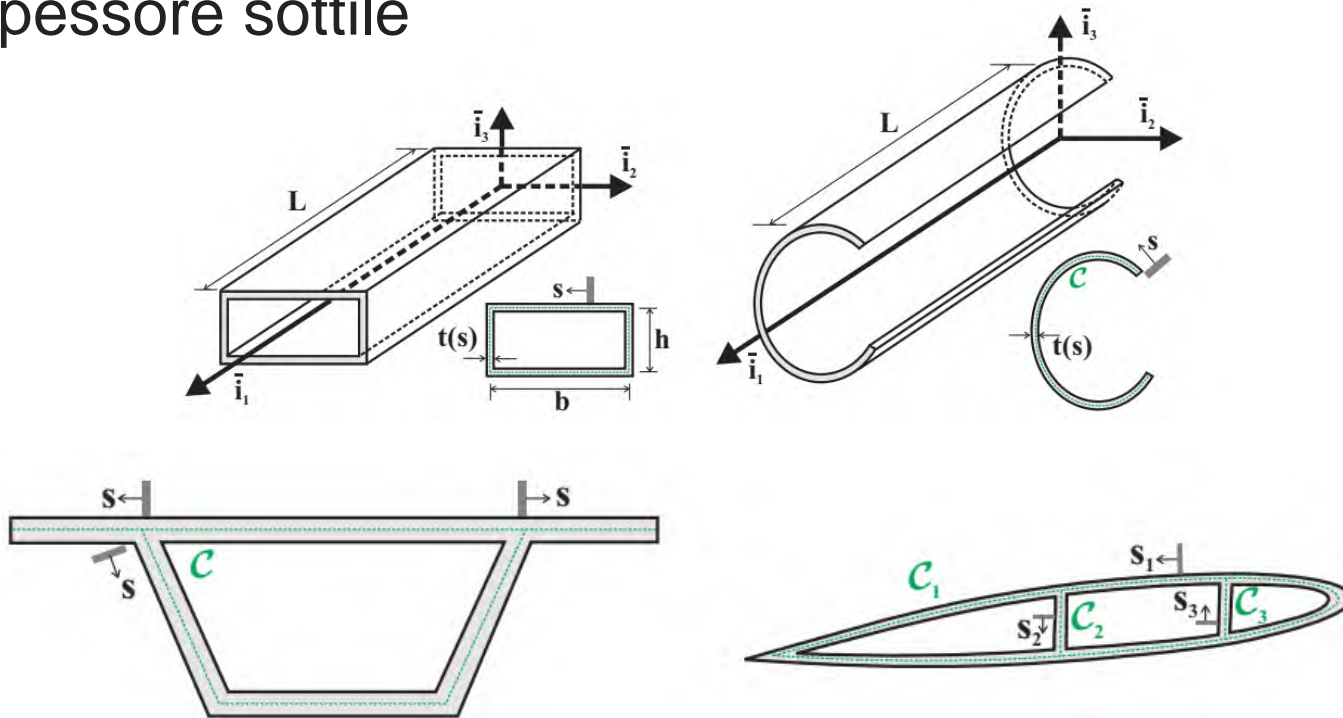


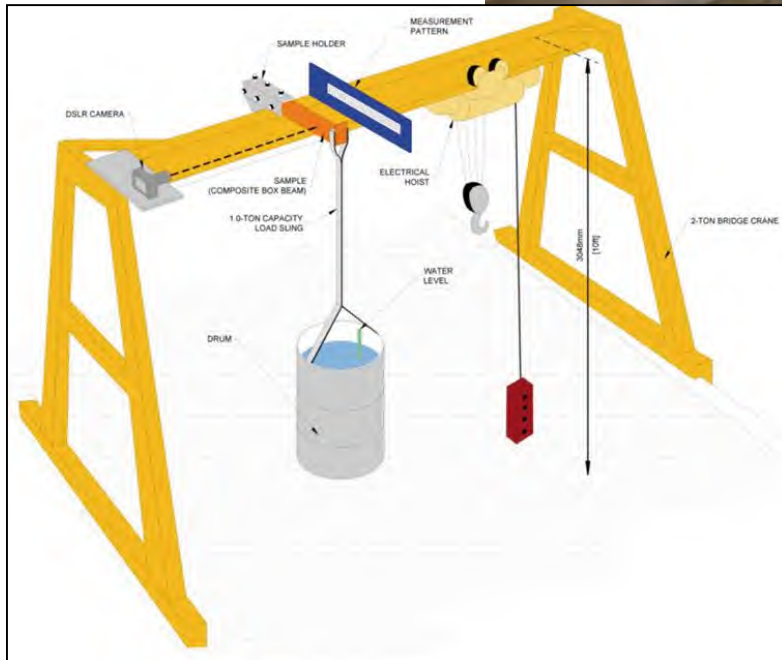
# Travi a parete sottile (Thin walled beams)

La sezione della trave è realizzata con elementi di spessore sottile

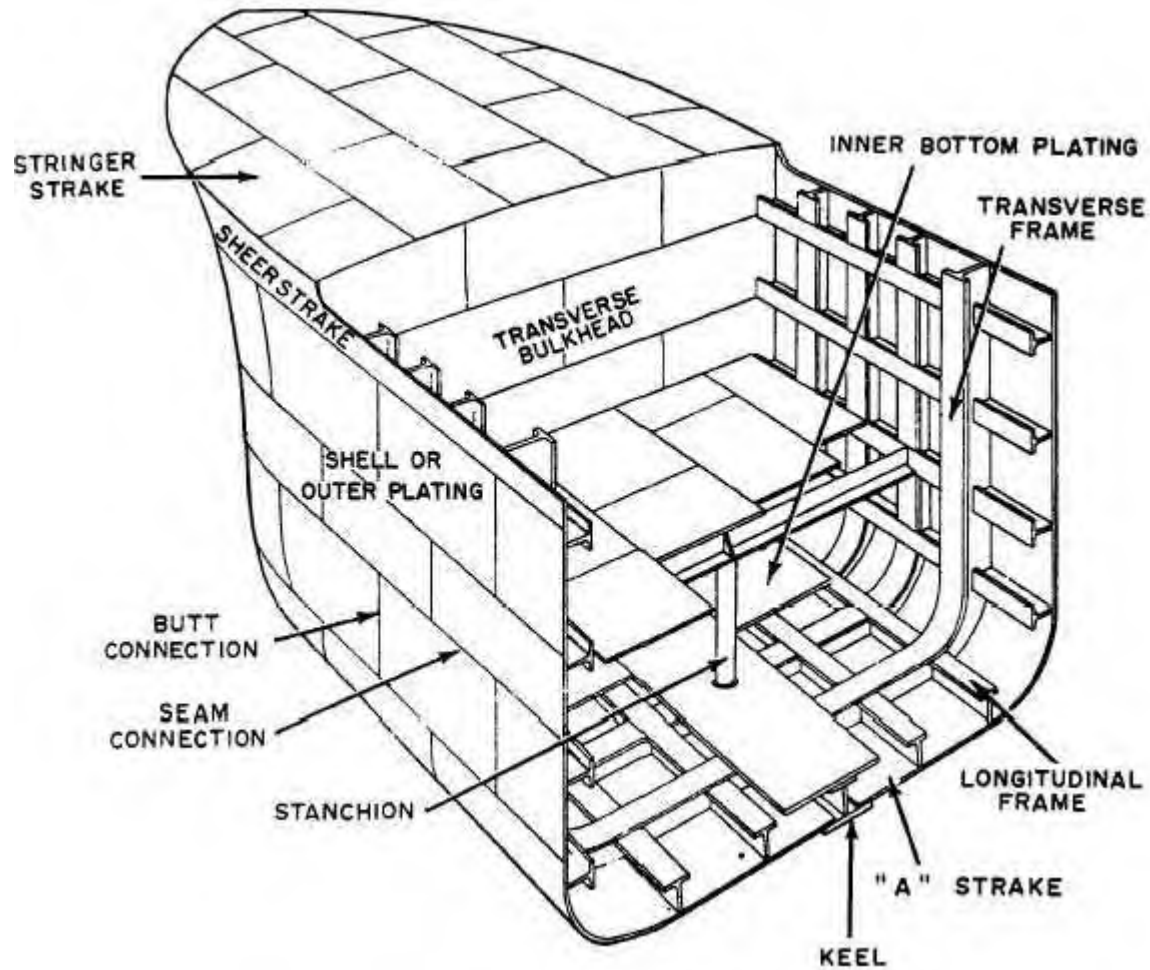


- La loro rigidezza flessionale per unità di massa è molto più elevata di quella di travi a sezione piena.
- Possono quindi essere ottenute travi molto rigide a flessione con minimo peso

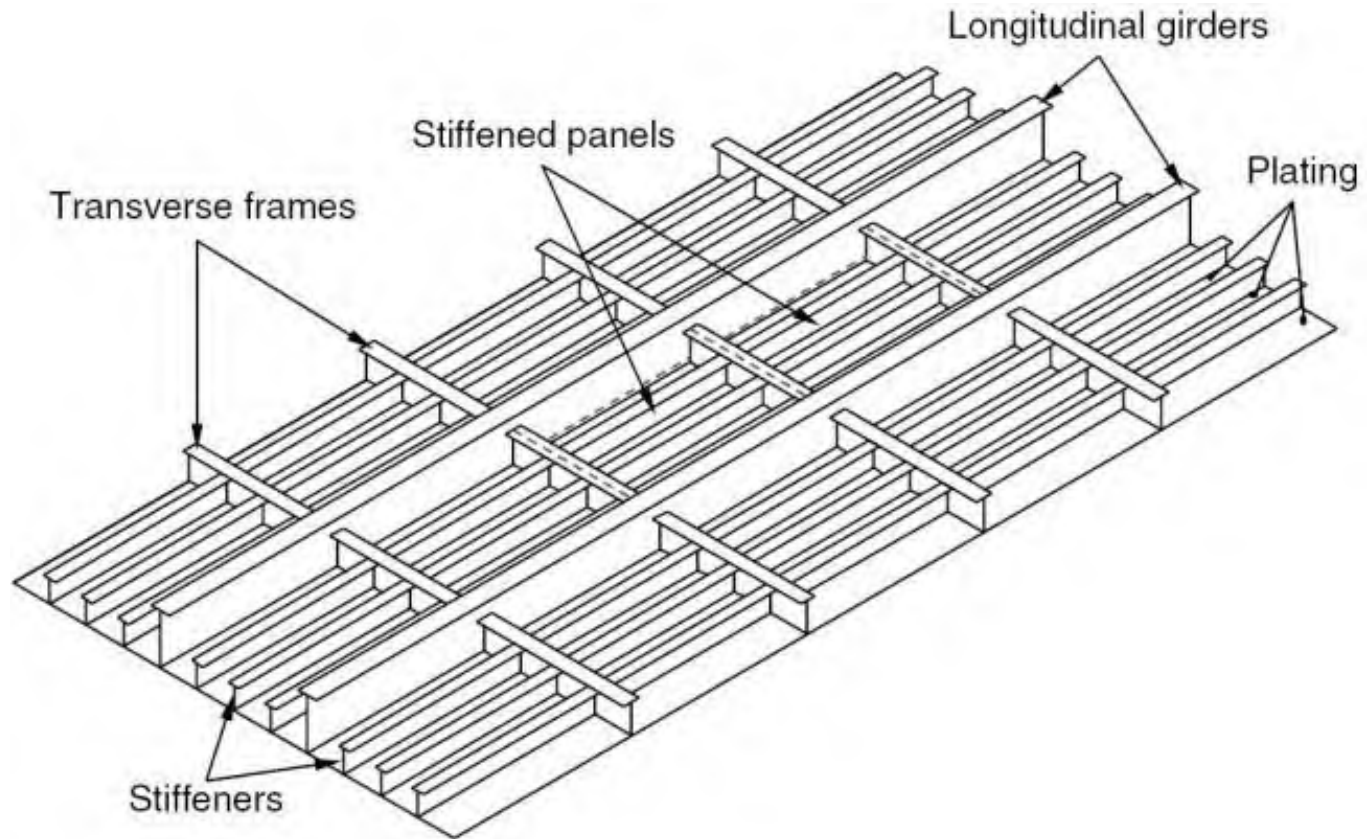
# Travi a parete sottile



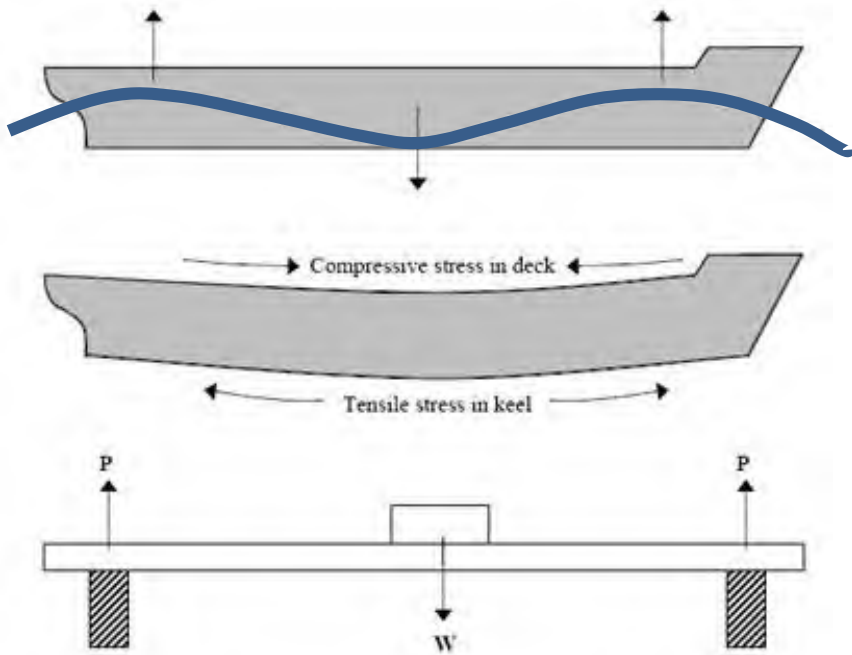
# Travi a parete sottile (campo nautico)



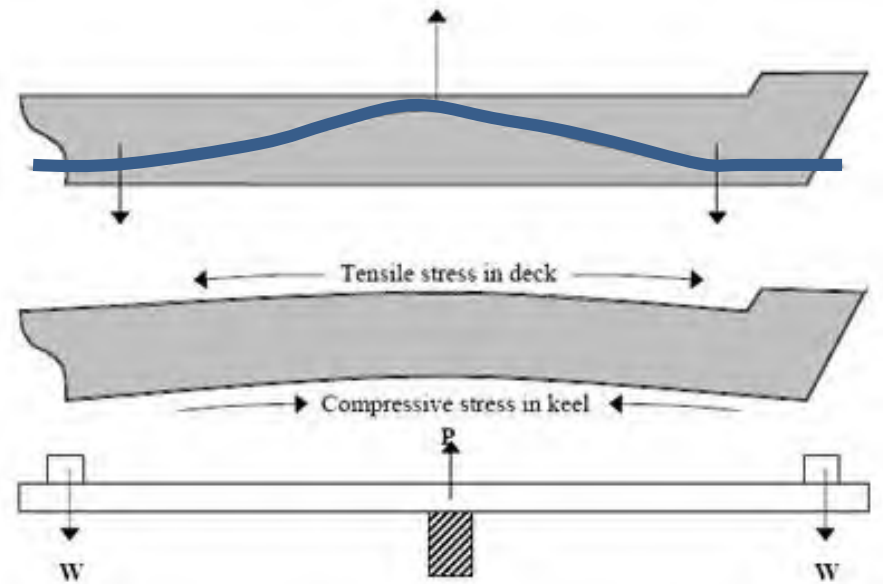
# Travi a parete sottile



# Travi a parete sottile

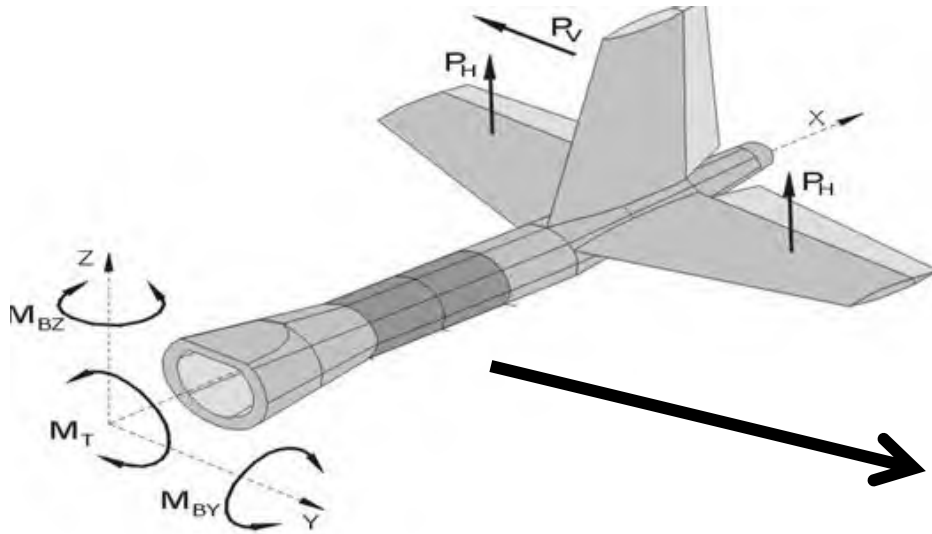


**HOGGING**

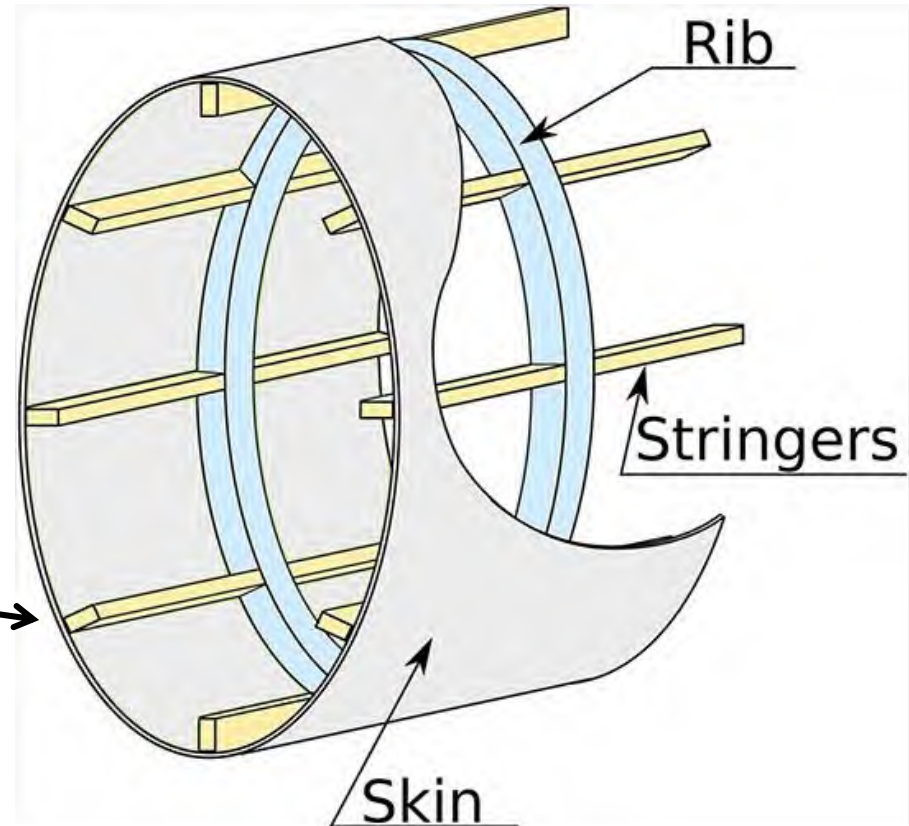


**SAGGING**

# Travi a parete sottile (campo aeronautico)

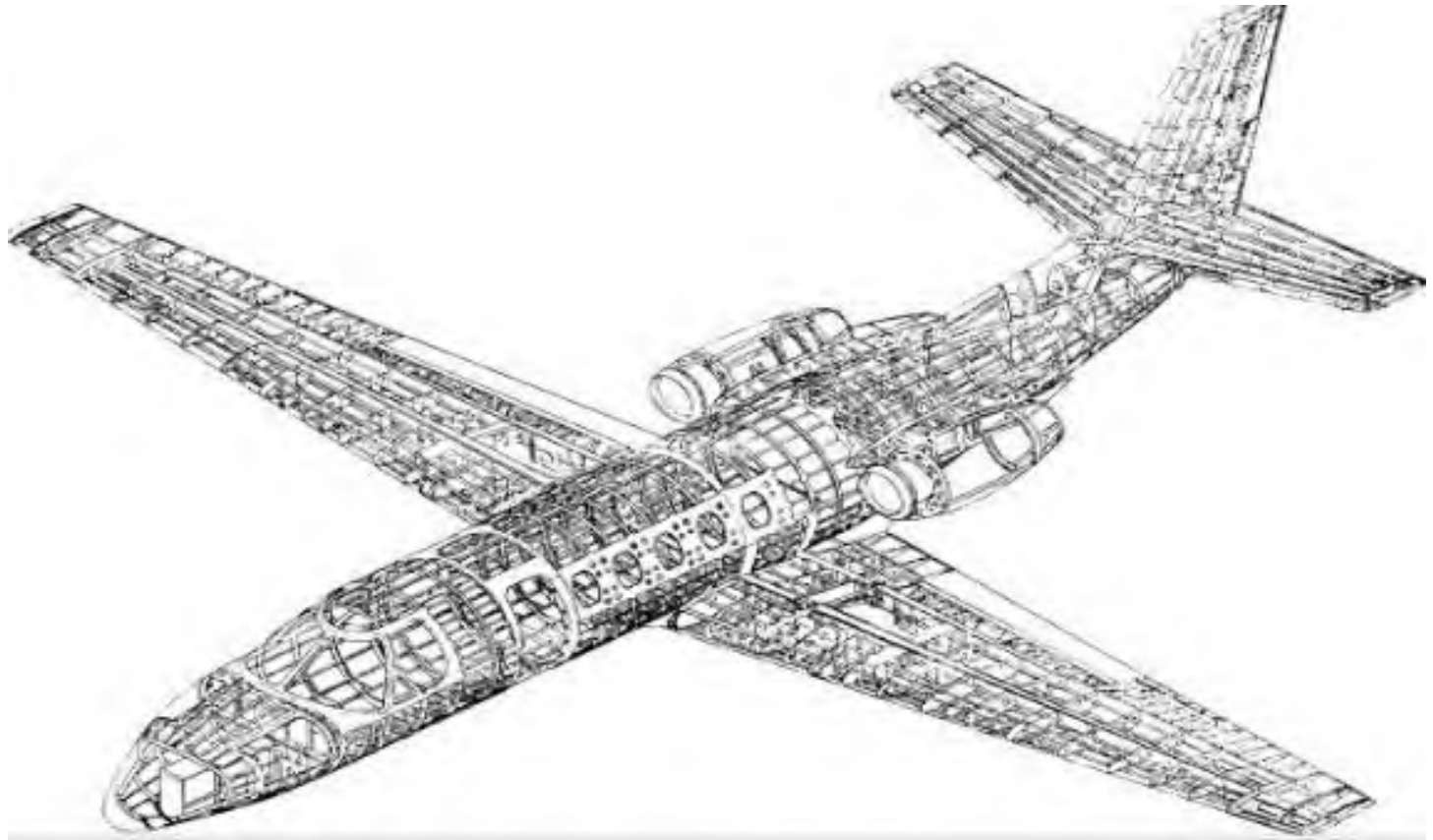


**Rinforzo trasversale:**  
Ordinate  
(frames, ribs)

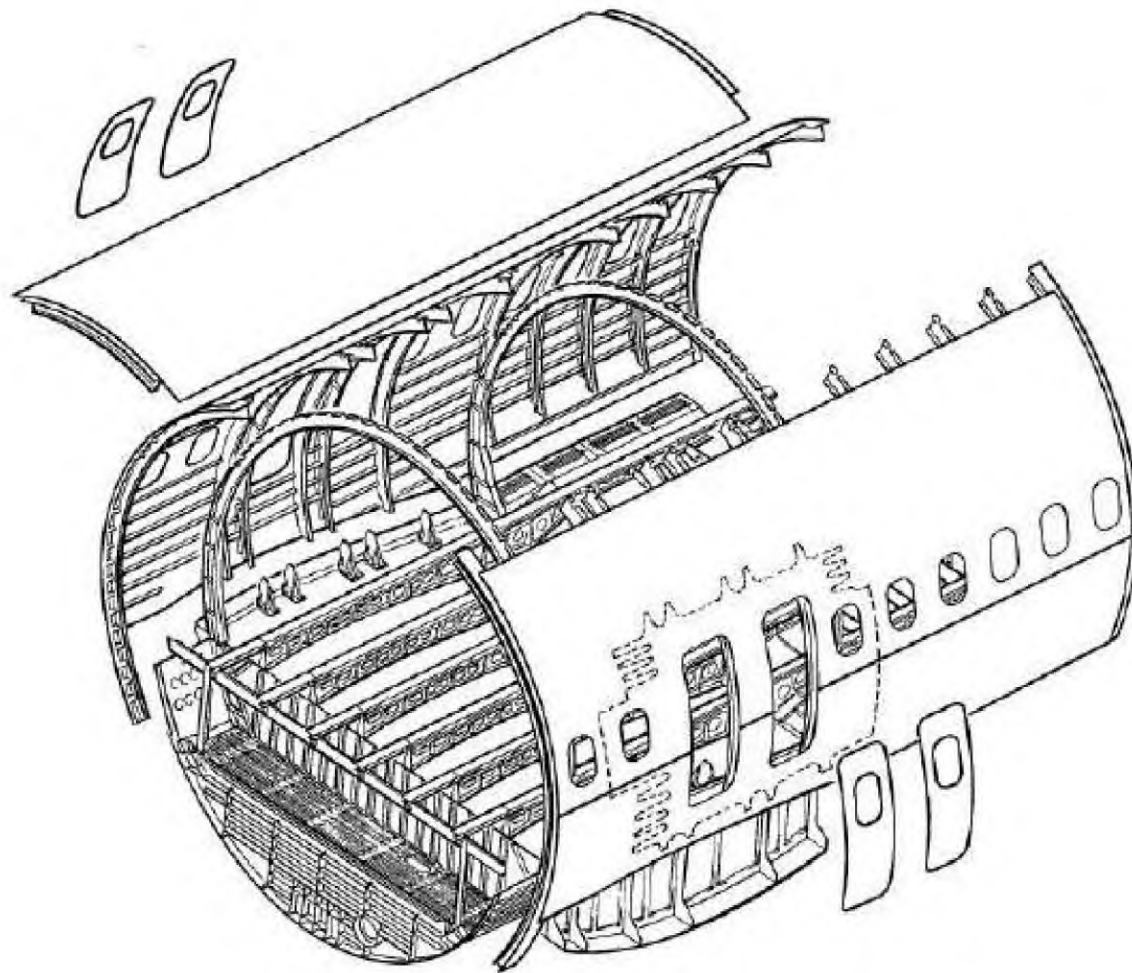


**Rinforzo longitudinale:**  
Longherone o corrente  
(stringer)

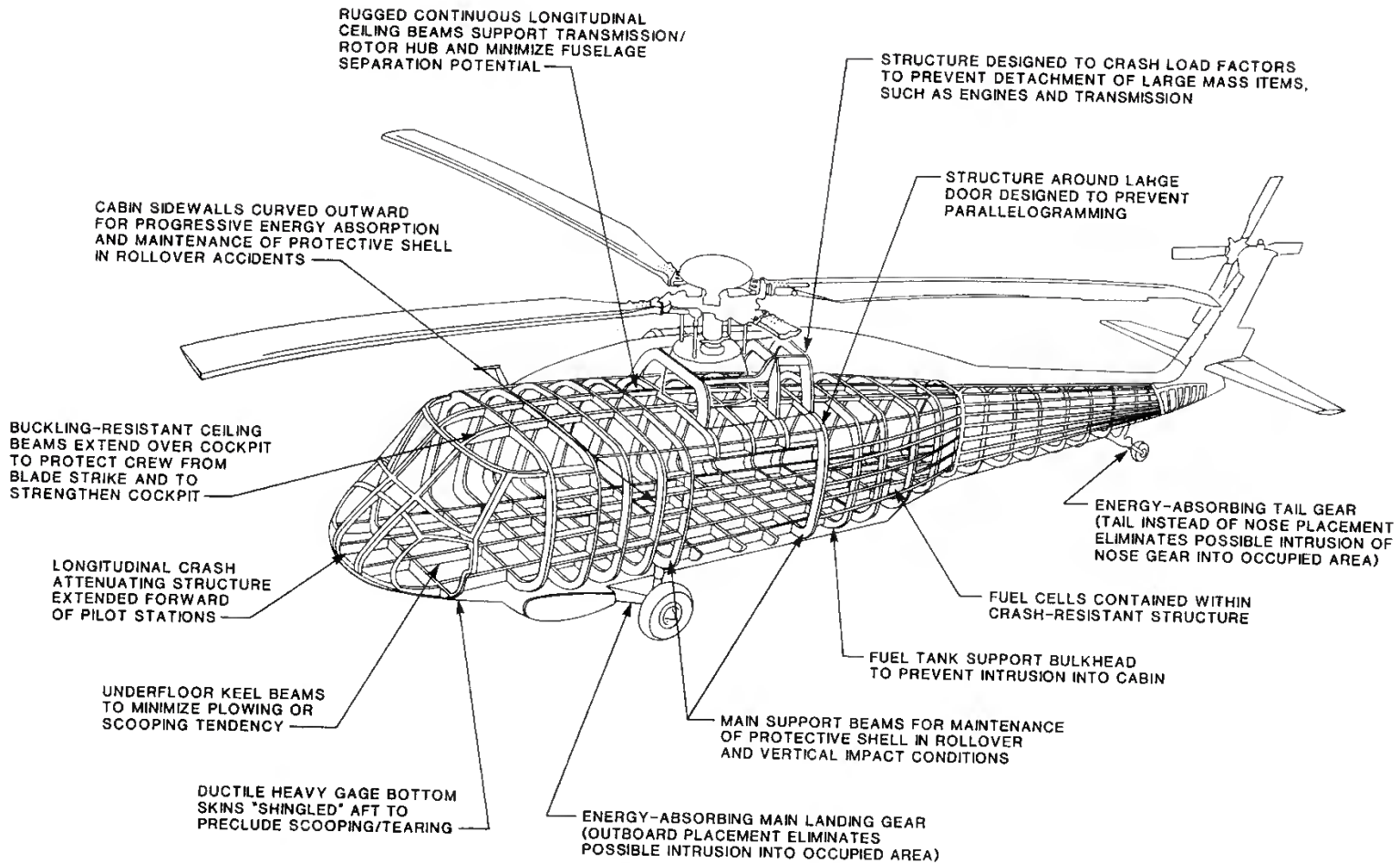
# Travi a parete sottile



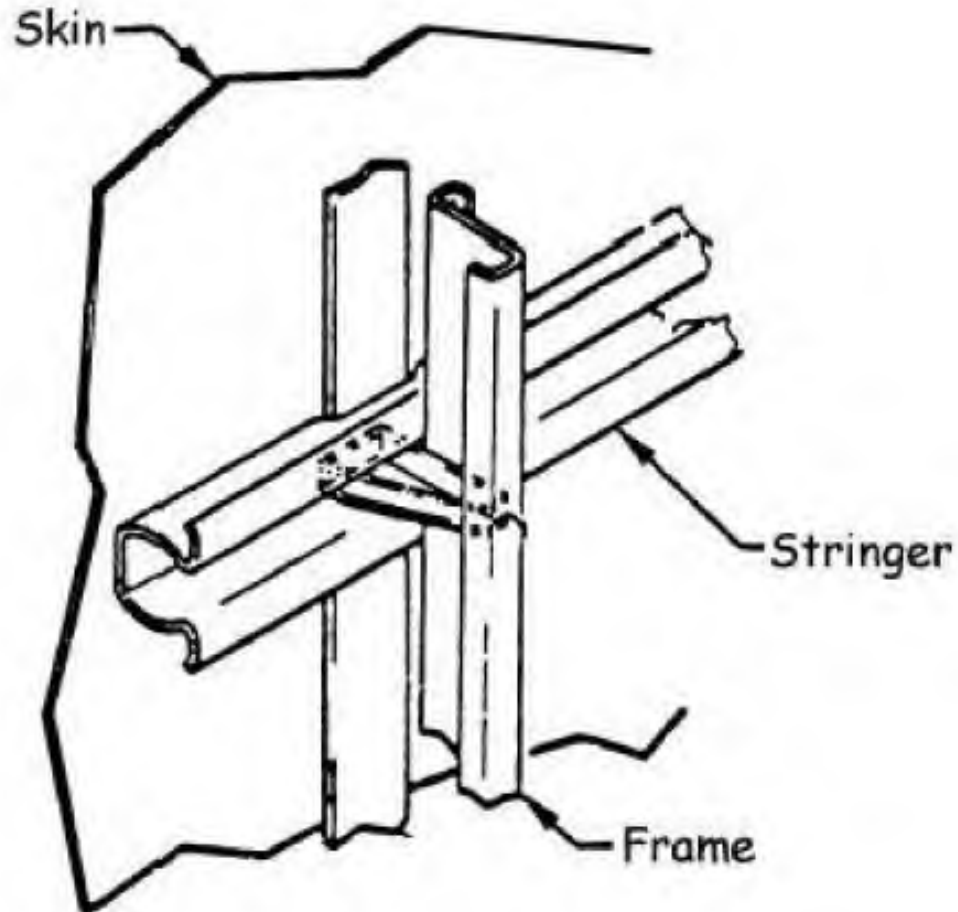
# Travi a parete sottile







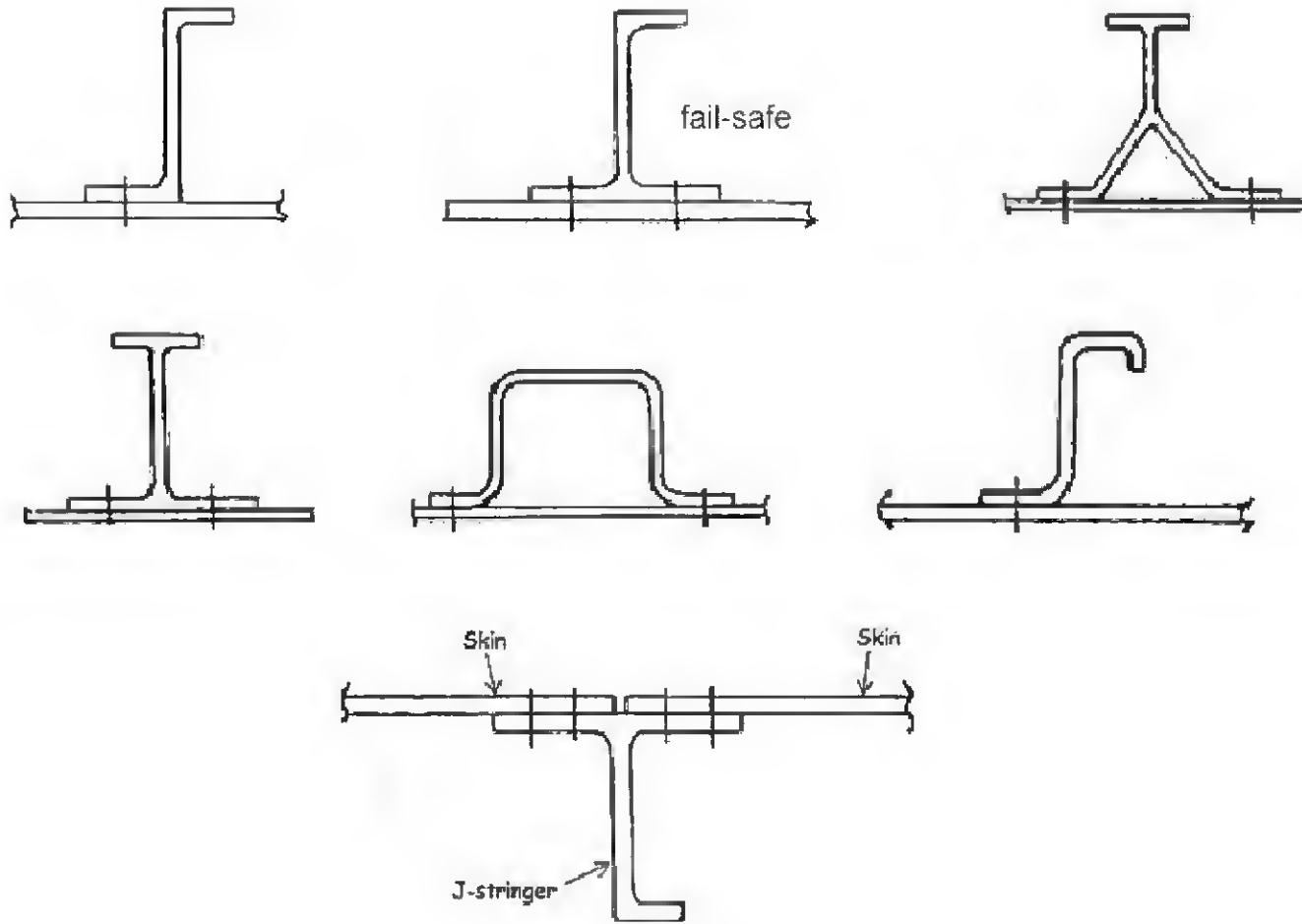
# Travi a parete sottile









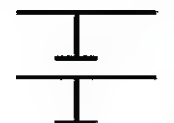
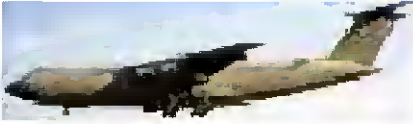


# Travi a parete sottile

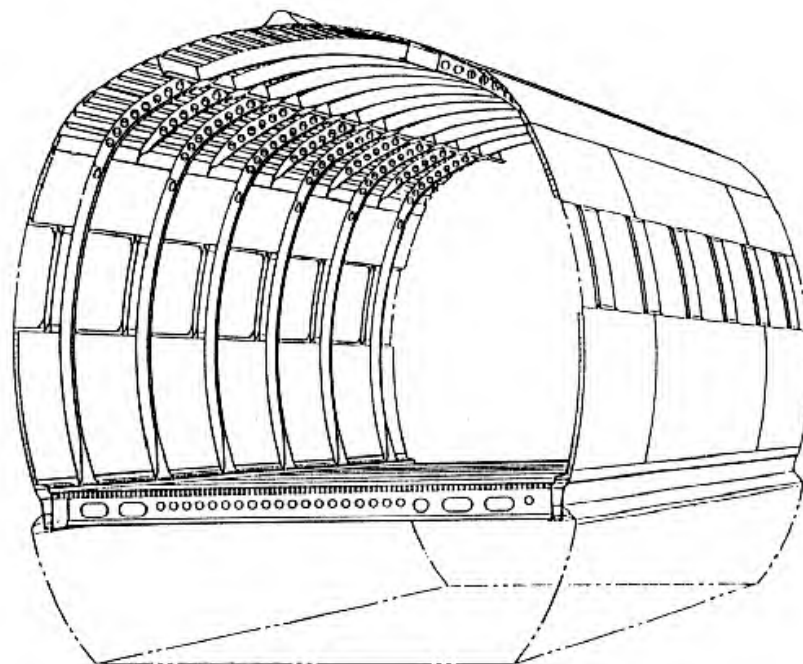
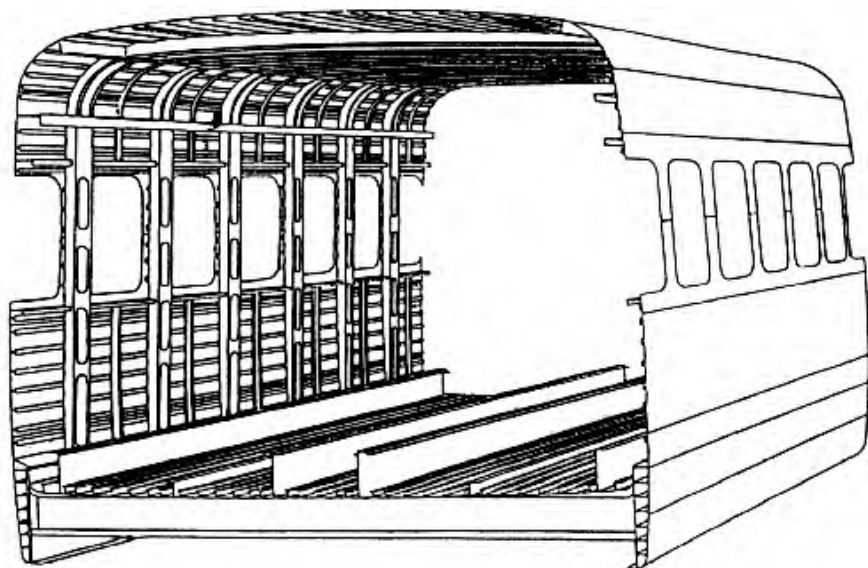


# Travi a parete sottile



Type Aircraft	Skin	Type structure	Material	Shape	
F100	upper lower	stringer stringer	7075-T6 2024-T3		
MD-90	upper lower	stringer stringer	7075-T6 2024-T3		
B 747	upper lower	stringer stringer	7075-T6 2024-T3		
A-300	upper lower	stringer stringer	7075-T6 2024-T3		
C-5A	upper lower	integral integral	7075-T6 7075-T6		

# Travi a parete sottile (campo ferroviario)



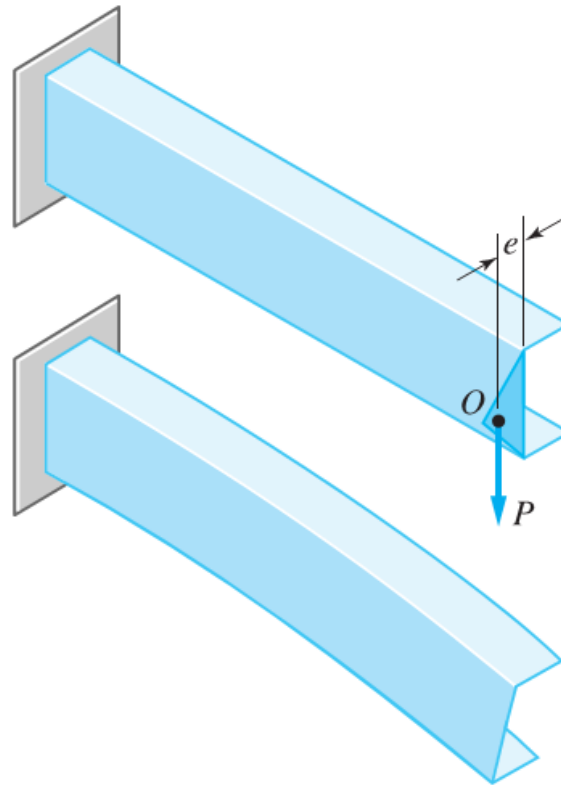
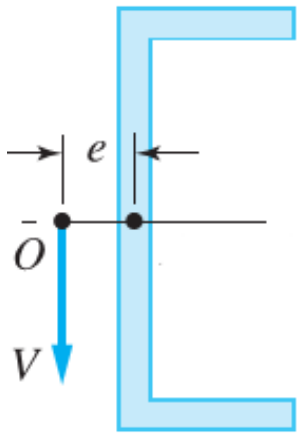
Shinkansen 300 (270 km/h)



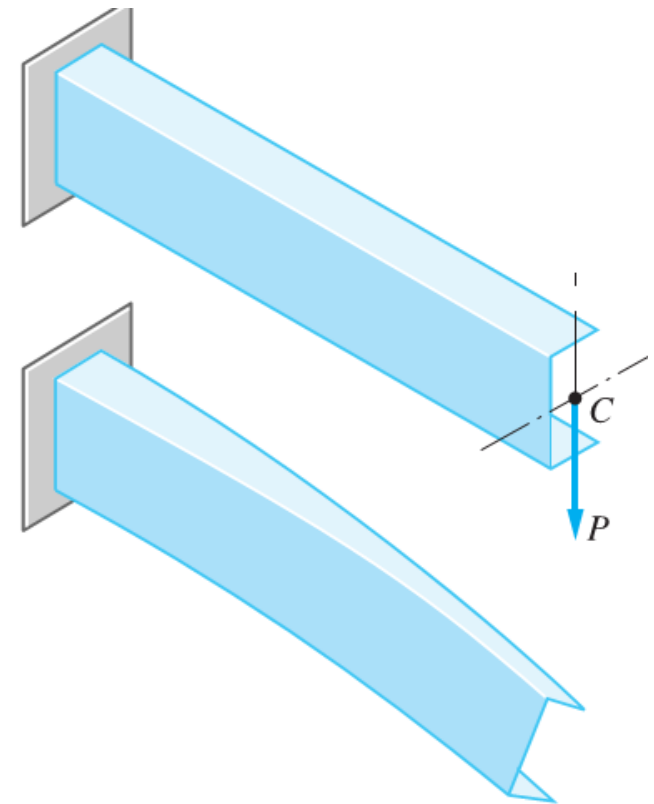
Shinkansen 500 (320 km/h)

## Travi a parete sottile

- Sforzi tangenziali  $\tau$  dovuti al taglio  $T$
- Centro di taglio e Torsione spuria
- Sforzi tangenziali  $\tau$  dovuti al momento torcente  $M_t$



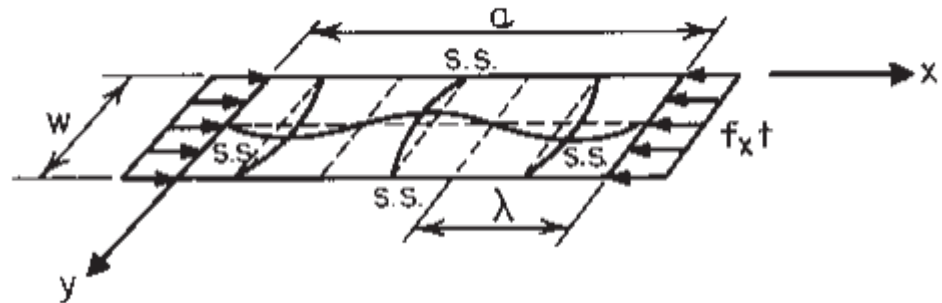
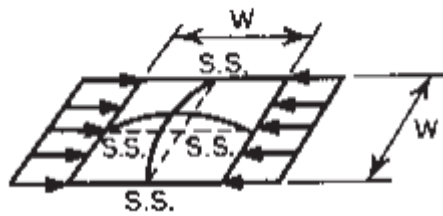
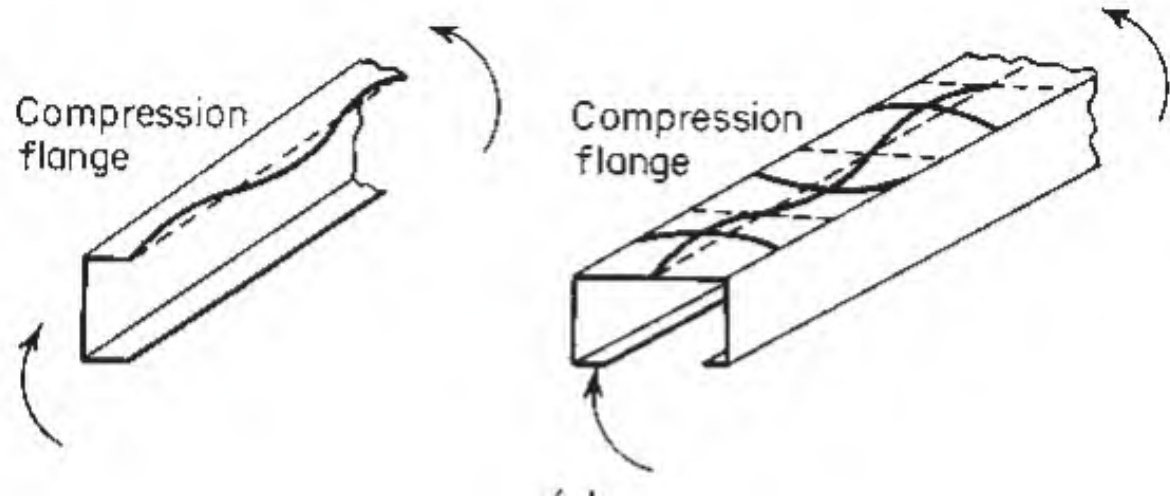
AZIONE T PASSANTE  
PER IL CENTRO DI TAGLIO  
- FLESSIONE -



AZIONE T **NON** PASSANTE  
PER IL CENTRO DI TAGLIO  
- FLESSIONE + **TORSIONE** -

# LOCAL BUCKLING (INSTABILITA')

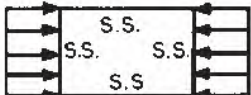
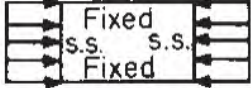
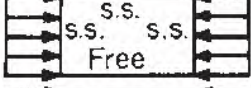
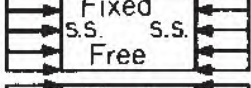
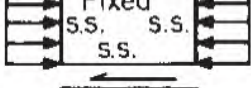
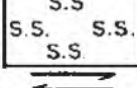

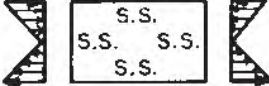
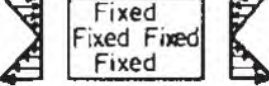
Flangia soggetta  
a compressione





# SFORZO CRITICO DI BUCKLING

$$f_{cr} = k \frac{\pi^2 E}{12(1 - \mu^2) (w/t)^2}$$

Case	Boundary Condition	Type of Stress	Value of $k$ for Long Plate
(a)		Compression	4.0
(b)		Compression	6.97
(c)		Compression	0.425
(d)		Compression	1.277
(e)		Compression	5.42
(f)		Shear	5.34
(g)		Shear	8.98
(h)		Bending	23.9
(i)		Bending	41.8

