WHY COMPOSITES? Application to aero structures, per Colin Adam 10/1/92 ("outdated, but the ideas are good")

	Mg	Al	Ti	Maraging STL	Gr/Ep, 60 v%
Cost $/lb	3	2	12	7	25
Density ρ lbf/in^3	0.07	0.1	0.14	0.3	0.06
Ult. Strength σ_u , 10^3 psi	67	70	140	330	500
σ_u /ρ	910	700	1,000	1,100	**8,000**
σ_u /($\rho$$)	303	**350**	83	156	**320**
Toughness K_{1c}	10	35	100	200	20 (damage)
K_{1c} /ρ	140	350	**555**	**667**	320
K_{1c} /($\rho$$)	97	**175**	46	95	13
E 10^6 psi	6.7	10	14	30	36 (woven cloth)
E/ρ	95	100	100	100	**600**
E/($\rho$$)	32	**50**	8	13	24

ρ affects 100% of structure
σ_u affects 30% of structure (strength driven)
E affects 15% of structure (stiffness, buckling)
K_{1c} affects 20% of structure (fracture toughness, "damage tolerance")

Willing to pay $100-200/lb of weight saved;

Total cost = materials costs + design + machining + maintenance +…

For metals, talk "buy/fly" ratio (much machining); for composite, largely "net shape" manufacturing