Figure 5. Tensile strength and yield strength of test bars cast at room temperature, 343°C and 1,038°C.

Figure 6. Microstructural development of the unidirectionally solidified casting. (a) As cast. (b) Solutionized at 1,093°C for 9 hr. (c) Solutionized, and then aged at 510°C for 3 hr.

Table II. Hardness Improvement Through Double Heat Treatment

	As-Cast	Solutionized at 1,093°C for 10 hr.	Solutionized + Aged at 510°C for 3 hr.
VHN	358	286	474
Rockwell C	31	22	44

Table III. Comparison of Properties and Foundry Characteristics

Property or Characteristic	Berylco 42C	AISI 304 Stainless Steel
Casting Range (°C)	1,230–1,343	1,482–1,593
Density (g/cm ³)	8.1	7.75
Tensile Modulus (GPa)	193	193
UTS (MPa)	1,034	531
Elongation (%)	6	55
Thermal Conductivity at 100°C (W/m·K)	34.6	15.9
Hardness	R _C = 38	R _B = 84

within the primary nickel matrix. It is this matrix phase which provides hardening through precipitation after the aging treatment.

The Vickers microhardness and Rockwell hardness in the as-cast, solutionized, and aged conditions are compared in Table II. The Vickers hardness in the as-cast condition is 358, which decreases significantly upon solutionizing through the elimination of microsegregation. Then the hardness of the material increases to 474 after the aging treatment. The Rockwell hardness (R_C) follows a similar trend. The alloy also offers good strength in the as-cast condition, which is further improved by the two-step heat treatment (i.e., solutionizing and aging).

Table III compares the properties of Berylco 42C with AISI 304 stainless steel. The casting temperatures for the 42C alloy are 1,230–1,343°C, and, for stainless steel, the corresponding range is 1,482–1,593°C. The lower casting temperatures give manufacturing flexibility during processing by using lower cost nonferrous materials and processes. The modulus values are comparable. The

tensile strength is almost double that of stainless steel, and the 6% elongation in castings is considered adequate in many applications. The important aspect to note is that the thermal conductivity of the material is nearly twice that of stainless steel, enabling rotating applications where heat dissipation is a critical attribute.

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If you want more information on this subject, please circle reader service card number 60.

Correction

In the May 1989 issue, we inadvertently omitted Table VII from the article "Advanced Lightweight Alloys for Aerospace Applications" by William E. Frazier, Eui W. Lee, Mary E. Donnellan and

James J. Thompson, which appears on pages 22–26. The editors extend their apologies to the authors and readers and now take this opportunity to present the missing data.

Table VII. Typical Ambient Temperature Properties of Advanced Aerospace Magnesium Alloys

Alloy	Density (g/cm ³)	YS (MPa)	UTS (MPa)	Elong. (%)	Corrosion Rate*	Product Form
AZ91C-T6†	1.81	145	275	6	1,000 mpy	Casting
AZ91E-T6	1.81	145	275	6	8 mpy	Casting
WE54-T6	1.90	225	280	4	4 mpy	Casting
EA55B-T6	1.94	167	271	8	20 mpy	Casting
EA55RS-T4	1.94	370	425	14	8 mpy	Extrusion
EA65B-T6	1.92	130	235	7	20 mpy	Casting
EA65RS-T4	1.92	460	515	5	8 mpy	Extrusion

*20 days in a neutral salt fog.

†AZ91C is a currently used alloy shown for comparison.