DISCUSSION

Edwin Haibach[1] *(written discussion)*—How may the presented models account for directional properties (anisotropy) of materials? Which model was best?

G. E. Leese (author's closure)—The author acknowledges the fact that the perspectives offered in this paper are based primarily on results of research treating the subject material as isotropic. However, the effects of material anisotropy may be accounted for within the framework of the three general approaches discussed. Most notably is the effort directed towards three-dimensional constitutive modeling, which in turn provides input for predicting finite life. In some cases, the goal may be to adequately represent inherent anisotropic response for input into an effective stress/strain type of parameter. In other cases, description of anisotropic yield surface response, ultimately to quantify the plastic strain as well as the stress, may be required for correlation with life in any of the approaches discussed. Detailed descriptions of the modeling of materials, including anisotropy, are available in the open literature [e.g., *1-3*], with some specifically addressing multiaxial fatigue life [*4,5*].

Certainly, as extremely anisotropic materials (e.g., composites and single crystals) become more prominent in the engineering world, including the effects of anisotropy in durability and/or design analyses will become increasingly important. This is especially so for multiaxial environments.

Discussion References

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[*3*] Swanson, G. A. et al., "Life Prediction and Constitutive Models for Engine Hot Section Anisotropic Materials," NASA CR-174952, NASA-Lewis Research Center, Cleveland, Ohio.

[*4*] Harvey, S. J., Toor, A. P., Adkin, P. A., "The Use of Anisotropic Yield Surfaces in Cyclic Plasticity," in *Multiaxial Fatigue, ASTM STP 853*, American Society for Testing and Materials, Philadelphia, 1985, pp. 49-63.

[*5*] Found, M. S., "A Review of the Multiaxial Fatigue Testing of Fiber Reinforced Plastics," in *Multiaxial Fatigue, ASTM STP 853*, American Society for Testing and Materials, Philadelphia, 1985, pp. 381-395.

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