RGEG Position Evaluation Report

Researcher: Ted D. Baer

Peer Group: **Aerodynamics and Acoustics**

Summary Scores

Factor I – Research Assignment	Factor II – Supervision Received	Factor III – Guidelines and Originality	Factor IV – Qualifications and Contributions
D	D	D	D

Total Score: 40 **Grade Conversion:** GS-14

Factor I – Research Assignment

The panel assigned Degree D for this factor because:

- The incumbent conducts pioneering research in shape memory alloys (SMA), a complex field with issues in many different discipline areas in which significant advances must be made for applications to be successful.
- Through individual research and the formation of cross-competency teams, the incumbent has laid the groundwork for advancements in many different aspects of the understanding and application of SMAs for the foreseeable future.
- The incumbent's research has built LaRC's SMA expertise from the ground up and is currently being expanded to include other engineers.
- The incumbent's research has a number of important applications in a wide range of fields and has the potential to have a revolutionary impact in future aircraft. The potential applications of the research area are only beginning to be explored.
- The incumbent leads a model development team and provides technical leadership for a number of other teams that were formed by him based on identified research needs.

The incumbent exceeds the requirements of Degree C as evidenced by the above. The scope of this research area is not broad enough to assign Degree E.

Factor II – Supervision Received

The panel assigned Degree D for this factor because:

- The incumbent receives minimal technical supervision from his supervisor and has complete responsibility for formulating a research plan, enlisting and negotiating support of other organizations and directing the research plan.
- The incumbent is solely responsible for the technical direction of several research teams.
- The incumbent has full authority to represent SAB and LaRC in the incumbent's areas of expertise both within and outside NASA. He is expected to disseminate research plans and findings directly to outside technical organizations.

The latter two meet criteria that exceed Degree C.

Factor III – Guidelines and Originality

The panel assigned Degree <u>D</u> for this factor because:

- There is limited prior research into SMA modeling upon which incumbent has been able to draw in his own research. Prior modeling efforts have not been of the appropriate physical scale or have been limited to incompatible applications. Due to limited physical understanding of SMAs they have seen little application in structural systems and previous efforts have had little prior concept development. However, there is an extensive body of knowledge concerning SMA properties in general.
- The research requires unique fabrication techniques and complex test techniques that are not used in other fields.
- The incumbent developed a brand new, validated constitutive model of SMAs. This constitutes a creative extension of an existing methodology that may one day supplant current models. He also developed a parallel program for the first SMA hybrid composite (SMAHC) structures fabricated by NASA. The SMA materials characterization research is the first within NASA. For this reason Degree C is exceeded.

Factor IV – Qualifications and Contributions

The panel assigned Degree <u>D</u> for this factor because:

- Through personal research and leadership and technical direction of teams, the incumbent's research has made significant advancements in SMA research:
    - The materials characterization effort has led to discovery of important material characteristics with significant modeling implications.
    - Thermomechanical cycle dependency has been studied and a method for automation of thermomechanical training of SMA actuators has been devised.
    - The incumbent developed methods for mass-producing SMA actuators to reduce processing time by a factor of 10.
    - The incumbent developed the only commercially viable process for embedding SMA actuators in laminated composite structures.
- The incumbent's research has formed NASA's entire body of expertise in modeling, characterization, fabrication and testing of SMAs and the research is currently being expanded beyond what the incumbent has accomplished. Even though LaRC does not have a strong capability in adaptive structures, he has single-handedly made LaRC a world leader in SMA research.
- Evidence of technical recognition and stature in the field:
    - Co-instructor for a short course.
    - Conference technical program committee, three conference technical session chairs.

As evidenced by the above, Degree C is exceeded.

General comments:

The incumbent is motivated by the desire to stay ahead of the field and maintain research at the cutting edge. He is very receptive to suggested collaboration outside his organization and is good at breaking down cultural barriers that tend to limit collaboration between different structures branches. Continued rate of accomplishments at the current level allowing for the impact of his work to materialize over time should support further advancement.