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Report Title

Final Report: Benchmarking the Technology and Application of Lightweighting

ABSTRACT

See Attachment

Enter List of papers submitted or published that acknowledge ARO support from the start of the project to the date of this printing. List the papers, including journal references, in the following categories:

(a) Papers published in peer-reviewed journals (N/A for none)

Received Paper

TOTAL:

Number of Papers published in peer-reviewed journals:

(b) Papers published in non-peer-reviewed journals (N/A for none)

Received Paper

TOTAL:

Number of Papers published in non peer-reviewed journals:

(c) Presentations

Number of Presentations: 0.00

Non Peer-Reviewed Conference Proceeding publications (other than abstracts):

Received Paper

TOTAL:

Number of Non Peer-Reviewed Conference Proceeding publications (other than abstracts):

Peer-Reviewed Conference Proceeding publications (other than abstracts):

Received Paper

TOTAL:

Number of Peer-Reviewed Conference Proceeding publications (other than abstracts):

(d) Manuscripts

Received Paper

TOTAL:

Number of Manuscripts:

Books

Received Book

TOTAL:

Received	Book Chapter

TOTAL:

Patents Submitted

N/A

Patents Awarded

Awards

N/A

Graduate Students

NAME	PERCENT_SUPPORTED
FTE Equivalent:	
Total Number:	

Names of Post Doctorates

NAME	PERCENT_SUPPORTED
FTE Equivalent:	
Total Number:	

Names of Faculty Supported

NAME	PERCENT_SUPPORTED	National Academy Member
Madeline Woodruf	0.40	Yes
Ricky Washington	0.10	Yes
Laura Toth	0.08	Yes
Susan Maurizi	0.01	Yes
Heather Lozowski	0.07	Yes
FTE Equivalent:	**0.66**	
Total Number:	**5**	

Names of Under Graduate students supported

NAME	PERCENT_SUPPORTED
FTE Equivalent:	
Total Number:	

Student Metrics

This section only applies to graduating undergraduates supported by this agreement in this reporting period

The number of undergraduates funded by this agreement who graduated during this period:	0.00
The number of undergraduates funded by this agreement who graduated during this period with a degree in science, mathematics, engineering, or technology fields:.....	0.00
The number of undergraduates funded by your agreement who graduated during this period and will continue to pursue a graduate or Ph.D. degree in science, mathematics, engineering, or technology fields:.....	0.00
Number of graduating undergraduates who achieved a 3.5 GPA to 4.0 (4.0 max scale):.....	0.00
Number of graduating undergraduates funded by a DoD funded Center of Excellence grant for Education, Research and Engineering:.....	0.00
The number of undergraduates funded by your agreement who graduated during this period and intend to work for the Department of Defense	0.00
The number of undergraduates funded by your agreement who graduated during this period and will receive scholarships or fellowships for further studies in science, mathematics, engineering or technology fields:	0.00

Names of Personnel receiving masters degrees

NAME
Total Number:

Names of personnel receiving PHDs

NAME
Total Number:

Names of other research staff

NAME	PERCENT_SUPPORTED
FTE Equivalent:	
Total Number:	

Sub Contractors (DD882)

Inventions (DD882)

Scientific Progress

Technology Transfer

Division on Engineering and Physical Sciences
National Materials and Manufacturing Board
Committee on Benchmarking the Technology and Application of Lightweighting

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February 13, 2015

Final Progress Report

Project Identification

Project Title: Committee on Benchmarking the Technology and Application of Lightweighting
Reporting Period: December 9, 2009 to December 31, 2011

Summary

The Committee on Benchmarking the Technology and Application of Lightweighting (CBTAL) was appointed on June 2010 and held its first meeting in July 2010. The committee held its second and third meetings on September 20-21, 2010 and October 28-29, 2010, respectively. Its fourth and final meeting was held at the NRC's Beckman Center in Irvine CA on January 17-19, 2011. The report was released as a prepublication draft on December 12, 2011. The final book version of the report was released in 2012 and is available at http://www.nap.edu/catalog/13277/application-of-lightweighting-technology-to-military-vehicles-vessels-and-aircraft. Additional copies of the book are available to sponsors on request to the National Materials and Manufacturing Board (NMMB).

Activities

Project Initiation

The Committee on Benchmarking the Technology and Application of Lightweighting (CBTAL) was convened to assess the current state of lightweighting implementation. The charge provided to the committee was as follows -

A committee of the National Academies will be convened to assess the current state of lightweighting implementation. To do so, the committee will:

- Assess the relevance of the definition of lightweighting within the materials community.
- Assess and benchmark the current state of lightweighting implementation in land, sea and air transport systems in the military and civil sectors, with a primary emphasis on military systems and equipment.
- Make recommendations for ways in which the use of lightweight materials and lightweight solutions might be better implemented in military and dual-use systems.

As part of its assessment, the committee will consider:

- The use of lightweight materials and lightweight design;
- The availability of lightweight materials from domestic manufacturers;

- The performance of various lightweight materials and manufacturing technologies; and
- The trade space (that is, the impact that use of lightweight materials will have on the required performance and function of various systems, platforms, and components) for determining the value of lightweighting.

Chosen for their breadth and range of expertise, members on the CBTAL were appointed by the National Research Council (NRC) to carry out this study and produce the report, under the oversight of the National Materials Advisory Board, now known as the National Materials and Manufacturing Board. The committee membership was as follows:

L. Catherine Brinson (Chair), Northwestern University, Evanston, IL
John Allison, University of Michigan, Ann Arbor, MI
Julie Chen, University of Massachusetts, Lowell, MA
David Clarke, Harvard University, Cambridge, MA
Brad Cowles, Pratt and Whitney (retired)
George T. ("Rusty") Gray, III, Los Alamos National Laboratory, Los Alamos, NM
Eric Greene, Eric Greene Associates, Annapolis, MD
Wesley Harris, Massachusetts Institute of Technology, Cambridge, MA
Manish Mehta, National Center for Manufacturing Sciences, Ann Arbor, MI
Greg Olson, Northwestern University, Evanston, IL
Charles Saff, The Boeing Company, St. Louis, MO
Darrel Tenney, NASA Langley Research Center (retired)
Frank Zok, University of California, Santa Barbara, CA

Meetings

CBTAL held its first meeting on July 20-21, 2010. In addition to some closed committee sessions to complete NRC committee requirements and to provide time for the committee to discuss its task and its approach to producing the report, the committee heard presentations from sponsor representatives including Julie Christodoulou from ONR's Naval Materials Division, John Deloach from ONR's Structural Metals and Processing Division, and Suveen Mathaudhu, from ARL's Lightweight and Specialty Metals Branch. On the second day of the meeting, the committee also heard presentations from Gene Camponeschi, with the U.S. Navy Carderock Division, Structures and Composites, and from committee member Manish Mehta on an earlier NRC study on the use of lightweight materials in 21st century army trucks.

After its July 2010 meeting, the committee held several teleconferences to organize its next meeting as well as to further develop the report outline, first developed at the committee's first meeting. The second meeting, held on September 20-21, 2010 in Washington, DC, had several closed and open sessions. In open session, the committee heard from Robert A. Sielski, retired, Naval Sea Systems Command; Lisa Prokurat Franks, U.S. Army, Tank and Automotive Research, Development and Engineering Center (TARDEC); Robert Hathaway, Oshkosh Corporation; James Malas and Robert Rapson from Air Force Research Laboratory; and Charles Kuehmann, QuesTek Innovations. While in closed session, the committee reviewed text for the report draft, developed a work plan for the next report draft, and identified additional information needs, potential speakers, and topics for future meetings.

The committee met for a third time on October 28-29, 2010, with most of the meeting in plenary session, where the committee continued to develop the report, identifyied additional information needs, and developed a plan for the fourth and final meeting. In open session, the committee heard from committee member Rusty Gray III, Jim Ogonowski, from Boeing's Engineering-Airplane Structure Division, and Bruno Barthelemy, Chief Engineer, Body Structures/Closures for Ford Motor Company.

The committee's fourth and final meeting was held on January 17-19, 2011 at the Beckman Center in Irvine, California. All sessions were closed and the committee focused its attention at that meeting on revising the report and finalizing its findings and recommendations.

Report Review and Finalization

The committee spent the months following the final meeting finalizing the report and it entered the NRC internal review process in June 2011. Fourteen reviewers reviewed the report. They were:

Charles N Calvano, U.S. Naval Postgraduate School,
Ben Wang, Florida State University,
Richard R Paul, Independent Consultant,
W. Peter Cherry (NAE), Independent Consultant,
Robert E Schafrik, GE Aircraft Engines,
Jay Baron, Center for Automotive Research,
Paul J Kern (NAE), The Cohen Group,
Elizabeth A Holm, Sandia National Laboratories,
Mark Schaeffer, Mantech SRS,
William F Baker (NAE), Skidmore, Owings & Merrill,
Richard L Rumpf, Rumpf Associates International Inc.,
Donald U Gubser, Naval Research Laboratory, and
Haydn Wadley, University of Virginia.

The review was overseen by R. Steven Berry (NAS), University of Chicago. Appointed by the NRC, he was responsible for making certain that an independent examination of the report was carried out in accordance with institutional procedures and that all review comments were carefully considered.

The report was released in prepublication format mid-December 2011. Editing of the report was completed and the final book version of the report was released in March 2012. A PDF of the report is available, for free, on the National Academies Press website at http://www.nap.edu/catalog/13277/application-of-lightweighting-technology-to-military-vehicles-vessels-and-aircraft. Hard copies of the report are available to the sponsor on request to the NMMB.

Planned Activities

No further committee meetings are planned as the project is now complete.

END.