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Honegger, Barbara

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NPS Distinguished Professor Emeritus Robert E. Ball Wins Prestigious AIAA Best Book Award

■ by Barbara Honegger, M.S.

Naval Postgraduate School (NPS) Distinguished Professor Emeritus of Mechanical and Astronautical Engineering Robert E. Ball, “The Father of Aircraft Combat Survivability Education,” has won the prestigious American Institute of Aeronautics and Astronautics (AIAA) Summerfield Book Award for his pioneering textbook, *The Fundamentals of Aircraft Combat Survivability Analysis and Design, Second Edition*, the only book to address all aspects of aircraft survivability.

Aircraft combat survivability addresses active and passive man-made threats to the successful operation of military and civil aircraft and missiles and how to design air vehicles to minimize the effectiveness of such threats.

Ball received the award at a ceremony attended by over 1,000 members at the 45th annual Aerospace Sciences meeting in Reno, NV, 9 January. The honor is presented to the author of the book judged the best recently published by the professional association.

“I’m truly honored by this award,” Ball said in an interview after the ceremony. “It’s a good feeling, because it shows that the book, which grew out of the lectures and course notes for my aircraft combat survivability course at NPS—the first course on the subject taught anywhere in the world—has value.”

The creator and long-time editor of AIAA’s education series and former senior dean of the Air Force Institute of Technology, Dr. John S. Przemieniecki, underscored the importance of Ball’s book.

“Looking back at all the major AIAA book publications, I am convinced that Dr. Ball’s book made the most significant contributions to the state of the art in



Distinguished Professor Emeritus Robert Ball displays the second edition of his book, *The Fundamentals of Aircraft Combat Survivability and Design*, which has won the prestigious American Institute of Aeronautics and Astronautics (AIAA) 2006 Summerfield Book Award.

the aircraft industry, and specifically to improvements in survivability and reduction in vulnerability of the new generation of U.S. Air Force aircraft now entering the inventory for the new millennium,” Przemieniecki said in support of the nomination.

The second edition of the book, which was released in 2003, is significantly different from the first edition published in 1985.

“The second edition is more than just an expansion of the original,” Ball explained. “Though large amounts of new material have been added throughout—the new edition is more than twice as long as the original—it’s been rewritten to make it truly a student’s textbook. The essentials are contained in chapter one, and more detailed information follows in the sub-areas.”

The second edition also has an additional appendix on the application of probability

theory to survivability assessments, as well as student learning objectives at the beginning of each major section and problems at the end. Some examples of new content are the survivability features of a number of current U.S. military aircraft, including stealth and electronic countermeasures, and combat data from Operation Desert Storm only recently released to the public.

Looking back, Ball recalled how the book grew out of his notes and lectures for the pioneering NPS course.

“For survivability to become a design discipline, an educational program first had to be developed,” Ball noted, “and there was no better place to develop such a program than the Naval Postgraduate School, where officer students learn how to become aircraft engineers and designers. So I developed the first aircraft combat survivability course ever offered at an educational institution, at

NPS in 1977. Its primary goal was to teach these officers how to design survivable aircraft so they could establish realistic survivability requirements when they became Department of Defense program managers.”

Many of Ball’s former NPS students are doing just that, including RADM Timothy Heely, program executive officer for Strike Weapons and Unmanned Aviation.

“Of all the courses leading to my Master of Science degree from the Naval Postgraduate School (1985, Aeronautical Engineering), the one with the most applicability to me as both a single-seat jet pilot in A-7s and FA-18s and as the Chief Engineer for Naval Aviation was Dr. Ball’s course on aircraft survivability,” said Heely in his letter to the selection committee.

“The education I received from him at NPS has been applied directly to the design of the FA-18 Super Hornet, and the results of that design are superb.

“I am now ensuring that the same principles are being applied to Navy and Marine Corps unmanned aviation, of which I am the program executive officer,” Heely added. “This critical design aspect, survivability, is absolutely essential in today’s combat and its importance will only grow as we move forward. There is no doubt in my mind that, were it not for Dr. Robert Ball’s pioneering efforts and sustained leadership, we would be far, far behind where we are today.”

Many of Ball’s former students are now in leadership positions in the DoD and the aircraft industry.

“Many in DoD with the mission to increase the survivability of our military aircraft have been students of Bob’s here at NPS and in his many years of teaching short courses in the U.S. and throughout the world,” said NPS Professor Emeritus of Mechanical and Astronautical Engineering Conrad Newberry, who submitted Ball’s letter of nomination to the selection committee.

“Universities are the last institutions in any civilization to change,” Newberry stressed, “and though aircraft are essentially useless unless they’re survivable, and survivability needs to be addressed in the design of every plane, civilian universities don’t recognize aircraft survivability as a unique and separate discipline. So there are few, if any, doctoral researchers in this vital field. Notably, it was Robert Ball and the NPS who were the first to transcend such specialized concerns. Bob’s course, and his textbook which came out of it, are the only articulation of survivability as an engineering discipline in and of itself, which is what makes it so important. Simply put, *Aircraft Combat Survivability Analysis and Design* is the bible of the field.”

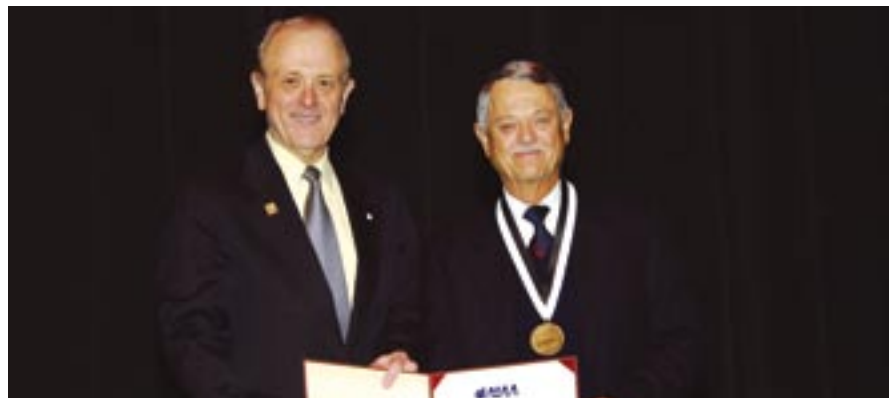
“Professor Ball is the world’s leading authority on aircraft combat survivability,” agreed Dr. John P. Fielding, professor of aircraft design and head, Department of Aerospace Engineering, Cranfield University, England. “Without his book, it would be impossible to produce realistic preliminary designs for combat aircraft. The first edition was outstanding, but the second is brilliant. It is extremely accessible, comprehensive and scholarly.”

“Not only is Bob’s the only book on all aspects of this critical subject available in the public domain anywhere in the world,” said NPS Professor of Mechanical and Astronautical Engineering Morris Driels, “it serves as the basic reference

work for new students and experienced practitioners alike and is a single-source reference for all who work in the area. Anyone involved in any aspect of aircraft design should have a copy.”

“When I was appointed the first director of live-fire testing when Congress passed the live-fire test requirement for all major DoD weapons and platforms in 1987, Dr. Ball was already leading the charge to not only encourage aircraft survivability in our weapons platforms, but also doing something about it,” said James F. O’Byron, who guest lectured in Ball’s courses at NPS. “His book is a world-recognized reference on the subject of aircraft combat survivability and the only book of its kind anywhere. I have copies of both the first and second editions and use them frequently for reference. I teach live-fire testing across the country and always recommend his book as required reading.”

When Ball retired from NPS in 1998, military instructor CDR Mark Couch, one of his former students, took over teaching his course. Five years later the NPS aeronautics program moved to the Air Force Institute of Technology, Couch was transferred to Japan and there was no one left at NPS to teach survivability. Fortunately, CDR Chris Adams, another of Ball’s former students, returned to NPS in 2005 as Associate Dean of the Graduate School of Engineering and Applied Sciences.



Naval Postgraduate School Distinguished Professor Emeritus Robert Ball (right) receives the AIAA Summerfield Book Award for his pioneering textbook *The Fundamentals of Aircraft Combat and Survivability Analysis and Design, Second Edition*, from AIAA President Roger Simpson at the 45th AIAA Aerospace Sciences Meeting awards luncheon, 9 January in Reno, NV.

“In addition to his duties as associate dean, I’m delighted to say that Chris has revived the teaching of survivability at the NPS, moving beyond aircraft survivability to teaching a course on the survivability of all types of military platforms for the Mechanical and Astronautical Engineering Department,” Ball noted.

Adams is teaching his platform survivability course ME 4751, an evolution of Ball’s course focused on aircraft, this Winter quarter.

Also this quarter, NPS will further build upon Ball’s pioneering foundation by standing up a new NPS Center for Survivability and Lethality.

“Twenty faculty members have already agreed to participate in the research of the new center, under MAE,” said Adams, who assisted with expanding the vulnerability reduction section of the first edition of Ball’s book. “A lot of air combat groups and people in industry want to take the platform survivability course via distance learning through the center.”

Since the first survivability course in 1977, Ball has taught approximately 4,000 military officers, DoD civilians, and U.S. aircraft industry personnel the fundamentals of the discipline and delivered short courses throughout the U.S. and to NATO in Europe, Canada, Greece, and Great Britain.

To spread the word about survivability, Ball’s course was selected in 1994 to be the first distributed learning (DL) course of the Department of Aeronautics and Astronautics’ new Master of Science degree program for the Naval Air Systems Command (NAVAIR). It was also the first NPS DL course to use two-way video and audio technology to present content simultaneously to students at NPS in Monterey and NAVAIR in Washington, DC. The most recent offering of Ball’s course was sent to six off-campus sites.

Ball’s textbooks, which have sold approximately 13,000 copies, including 4,000 purchased by the Department of Defense, were sponsored by the Joint Technical Coordinating Group on Aircraft Survivability (JTCCG/AS), now the Joint Aircraft Survivability Program Office (JASPO). The Original JTCCG/AS was established by the Joint Logistics Commanders shortly after the end of the Vietnam War as a result of the large number of U.S. aircraft downed by enemy fire in that conflict. One of its primary goals was to establish aircraft combat survivability as a design discipline to ensure that survivability is built into all U.S. military aircraft.

Ball received his bachelor’s and master’s degrees in civil engineering from Northwestern University, and his Ph.D. in structural mechanics, also from Northwestern, in 1962. After half a decade in industry directing research in structural and solid mechanics, he joined the Naval Postgraduate School faculty as an assistant professor in 1967. Ball was promoted to associate professor in 1970, full professor in 1978 and distinguished professor in 1994. He retired from teaching, becoming an NPS distinguished professor emeritus, in 1998.

The AIAA Summerfield Book award caps Ball’s many honors. He received the AIAA’s Survivability Award in 1996 and the DoD Deputy Director, Operational Test and Evaluation/Live-Fire Testing Arthur Stein Memorial Cup for Excellence in 2000 in recognition of his lifetime achievement in support of live-fire testing. The following year, Ball received the National Defense Industrial Association’s (NDIA) Combat Survivability Lifetime Achievement Award.

An AIAA Fellow, Ball established and served as the first chairman of the society’s Survivability Technical Committee from 1989 to 1992. In 1991, he was appointed chairman of the National Research Council’s Committee on Weapons Effects on Airborne Systems, serving until the final report was written in November 1992. In 1997, Ball served as an expert

witness on the National Transportation Safety Board’s public hearing on the TWA Flight 800 mishap.

The mission of the American Association of Aeronautics and Astronautics is to advance the state of aerospace science, engineering and technological leadership. The international professional association serves over 35,000 members in 65 regional sections and 79 countries.

To learn more about aircraft combat survivability, visit Professor Ball’s Aircraft Combat Survivability Education website at <http://www.aircraft-survivability.com/>. For more information about the new NPS Center for Survivability and Lethality, contact CDR Chris Adams at caadams@nps.edu, 831/656-2682. For detailed information about all NPS programs, go to <http://www.nps.edu>. ■

About the Author

Barbara Honegger, M.S. is Senior Military Affairs Journalist at the Naval Postgraduate School, the nation’s premier defense and security research university. Prior to coming to NPS in 1995, Ms. Honegger held a number of positions in the federal government, including White House Policy Analyst and Special Assistant to the Assistant to the President in the first Reagan Administration; the President’s liaison to the Defense Advisory Committee on Women in the (Military) Services (DACOWITS); and Director of the Attorney General’s Task Force on Legal Equity in the U.S. Department of Justice. She is co-author of *The Military Draft* (Hoover Institution Press, Stanford University), and author of *October Surprise*, on the genesis of Irangate. Ms. Honegger is a Naval War College graduate in National Security Decision Making, and holds a bachelor’s degree in Honors Writing from Stanford University and a master’s degree in Psychology from John F. Kennedy University, in California. Over the past decade, she has written and published hundreds of articles on the Naval Postgraduate School’s cutting edge research and educational programs. For current and archived articles, see <http://www.nps.edu>.