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Centennial Celebration of the Invention of Aerospace Engineering

THIS Editorial was originally written to serve as an introduction to the Special Section on Flight Vehicle Aeroelasticity published in Volume 40, Number 5 of the *Journal of Aircraft* (September/October 2003). Unfortunately, this Editorial was not published in that initial issue of the special sections. The Editorial is being published in the current issue (November/December 2003) to serve as an introduction to the special sections on Aeroelasticity, Air Transportation, Structures, and Aerodynamics.

Here in Dayton, Ohio, we have enjoyed an extended celebration called "Inventing Flight." Here is where two inventors, bicycle shop owners and mechanics Wilbur and Orville Wright, began thinking about a powered machine that could allow man to fly. As an engineering team, they began by designing big kites and taking them to Kittyhawk, North Carolina. There they experienced many failures. But to get to their incredible 1903 Flyer, they essentially had to invent the discipline of aeronautical engineering. They exploited, and had hand-built, a light version of the newly-invented internal combustion engine. They reasoned that the instability, yet ease of controllability of their bicycles could be extrapolated to their patented three-axis control of the Flyer. They effectively matured the propeller. They communicated extensively with mentors. They built a wind tunnel, the first ever to systematically measure the forces on candidate wing shapes. In September 1901, Wilbur delivered a paper to the Western Society of Engineers in Chicago, Illinois, suggesting, based on his measurements, that the Lilienthal data on lift and wing shapes was wrong. In short, they jump-started the very aerospace profession in which we engage and report the key results in this journal.

As indicated in the January/February 2003 issue of this journal, over this past year we developed a set of special sections to be published, beginning with the September/October 2003 issue. Each special section recounts selected key events over much of the past 100 years following that historical first flight by Orville Wright. Specific topics will include: Flight Vehicle Aeroelasticity, Air Transportation, Aerodynamics, and Structures. Conceived and developed by Associate Editor Frank Eastep, each of these special sections will lead off with a short editorial and an article reviewing historical aspects. Another segment will review the current state of the art, while a third segment will project future trends. These three segments will then be followed by a series of discipline area perspectives.

The initial special section in the September/October 2003 issue was Flight Vehicle Aeroelasticity, which covered the modern era of aeroelasticity or the second fifty years (1953–2003). The modern era of aeroelasticity began with the introduction of the digital computer, which intensified computational power. The increase of computer power allowed the emergence of the finite element method for structural dynamics. Additionally, lifting surface/paneling aerodynamics on interfering wings and bodies emerged as practical techniques for analyzing general complex configurations. More recently, techniques from high-fidelity computational fluid dynamics (CFD) codes have been coupled with finite-element models to determine aeroelastic solutions, referred to as "computational aeroelasticity." For the interested reader, two excellent classical reviews cover the first 50 years of aeroelasticity. The first is A. R. Collar's "The First Fifty Years of Aeroelasticity," and the second is Garrick and Reed's "Historical Development of Aircraft Flutter."

In the September/October 2003 issue three papers covered the historical perspective of aeroelasticity for the modern era. The first paper was a personal perspective of aeroelasticty of the modern era by John Dugundji, who has made major contributions to the development of aeroelasticity. That paper was followed by a historical review of aeroelastic research at Wright Field by Terry Harris and Larry Huttsell. The third paper of the historical review of aeroelasticity was a paper by Stan Cole, Tom Noll, and Boyd Perry, which described aeroelastic testing at Langley's transonic dynamic tunnel. Rudy Yurkovich followed these historical reviews with a paper describing the state of the art in unsteady aerodynamic predictions for flutter calculations. The final two papers provided a glimpse into the future of computational aeroelasticity. First, Dave Schuster, Danny Liu, and Larry Huttsell described the future of computational aeroelasticity and some of the challenges of CFD techniques for aeroelastic predictions. Finally in the special section, Earl Dowell, John Edwards, and Tom Strganac described the present and future techniques of nonlinear aeroelasticity prediction.

In this issue (November/December 2003) the special section on aeroelasticity continues with four papers. The first paper, by Kumar Bhatia, describes the practice and potential of using aeroelasticity in the design of flight vehicles. The next paper, by Eli Livne and Terry Weisshaar, describes the past and future challenges to aeroelasticity of unconventional configurations. The final two papers are survey papers. The first paper is a historical perspective of rotor wing Aeroelasticity, by Peretz Friedmann and Dewey Hodges. The second paper, by Eli Livne, is a far-reaching survey describing the future of airplane aeroelasticity. Finally, in forthcoming issues, special sections will appear devoted to Air Transportation, organized by Ken Holt; Aircraft Structures, organized by Mark Thompson; and Aerodynamics, organized by Ahmed Hassan.

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