



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: July 12, 2012

In reply refer to: A-12-28 through -39

The Honorable Michael P. Huerta
Acting Administrator
Federal Aviation Administration
Washington, DC 20590

These recommendations address the certification and flight testing of new experimental amateur-built (E-AB) aircraft and the training of the builders and test pilots of these aircraft, as well as of pilots who buy an E-AB as a used aircraft. The recommendations are derived from the NTSB's safety study, *The Safety of Experimental Amateur-Built Aircraft* (E-AB study), which was adopted by the Board on May 22, 2012.¹ As a result of this study, the NTSB has issued sixteen safety recommendations, twelve of which are addressed to the Federal Aviation Administration (FAA). Information supporting these recommendations is discussed below.

Fuel System Functional Test

NTSB analyses of E-AB aircraft accidents from 2001 through 2011 identified powerplant malfunctions and failures as the most common E-AB aircraft accident occurrence and second most common fatal accident occurrence overall. Powerplant occurrences were also the most common accident occurrence during Phase I flight testing.

Among the list of items identified in FAA Order 8130.2G, *Airworthiness Certification of Aircraft and Related Products*, to be determined during inspection for initial airworthiness certification of an E-AB aircraft are requirements that the flight controls, engine, and propeller operate properly and that applicants are required to submit a weight and balance report. However, no specific functional testing is currently required. The NTSB's E-AB study identified accidents involving loss of engine power during the first few hours of operation of a newly-built aircraft due to fuel system design deficiencies or malfunctions that could have been identified by functional testing prior to the first flight. Some of the fuel system design and installation problems found in these cases include incorrectly installed fuel lines,² crimped vent lines,³

¹ For more information, see *The Safety of Experimental Amateur-Built Aircraft*, Safety Study NTSB/SS-12/01 (Washington, D.C.: National Transportation Safety Board, 2012) on the NTSB website at <http://www.nts.gov>.

² For example, see NTSB accident case number LAX04LA132.

³ For example, see NTSB accident case number CEN09CA382.

system leaks,⁴ and a fuel system that did not provide adequate fuel pressure to maintain engine power.⁵

The NTSB concludes that a functional test of the aircraft fuel system could identify design deficiencies, leaks, and malfunctions prior to flight that would prevent fuel system- and powerplant-related accidents early in the operational life of an aircraft. The prevalence of E-AB aircraft powerplant malfunctions and failures would be reduced with the implementation of a functional test as part of the airworthiness certification process. Therefore, the NTSB recommends that the FAA revise 14 *Code of Federal Regulations* 21.193, FAA Order 8130.2G, and related guidance or regulations, as necessary, to define aircraft fuel system functional test procedures and require applicants for an airworthiness certificate for a powered experimental, operating amateur-built aircraft to conduct that test and submit a report of the results for FAA acceptance.

Flight Test Plan and Phase I Flight Testing

The Experimental Aircraft Association (EAA) conducted a voluntary survey of E-AB owners and builders in 2011. The results of this survey were shared with the NTSB and used in the E-AB study. EAA survey respondents who had achieved airworthiness certification of their E-AB aircraft were asked how detailed their Phase I flight test plans were—37 percent claimed to have a “very detailed” plan, while an additional 47 percent claimed a “somewhat detailed” plan, and 16 percent indicated a “somewhat informal” test plan. However, no consistent evidence of the existence or quality of flight test plans was available in accident investigation records or FAA certification files for the E-AB aircraft involved in accidents during 2011.

FAA Advisory Circular (AC) 90-89A provides extensive guidance to the E-AB aircraft builder for the development and execution of the flight test program, and it begins by stating the primary objectives of the flight test program:

- a. *The most important task* for an amateur-builder is to develop a comprehensive FLIGHT TEST PLAN. This PLAN should be individually tailored to define the aircraft’s specific level of performance. It is therefore important that the entire flight test plan be developed and completed BEFORE the aircraft’s first flight.
- b. *The objective of a FLIGHT TEST PLAN* is to determine the aircraft’s controllability through-out all the maneuvers and to detect any hazardous operating characteristics or design features. This data should be used in developing a FLIGHT MANUAL that specifies the aircraft’s performance and defines its operating envelope.⁶

However, the FAA does not require that an E-AB builder’s flight test plan be reviewed by an Aviation Safety Inspector or Designated Airworthiness Representative. Absent a review and assessment of the flight test program by the FAA, the adequacy of the flight test program stipulated in FAA Order 8130.2G cannot be ascertained or ensured. Therefore, the NTSB

⁴ For example, see NTSB accident case number LAX02LA256.

⁵ For example, see NTSB accident case number LAX07LA220.

⁶ FAA AC 90-89A, *Amateur-Built Aircraft and Ultralight Flight Testing Handbook*, May 24, 1995.

recommends that the FAA revise 14 *Code of Federal Regulations* 21.193, FAA Order 8130.2G, and related guidance or regulations, as necessary, to require applicants for an airworthiness certificate for experimental, operating amateur-built aircraft to submit for FAA acceptance a flight test plan that will (1) ensure the aircraft has been adequately tested and has been determined to be safe to fly within the aircraft's flight envelope and (2) produce flight test data to develop an accurate and complete aircraft flight manual and to establish emergency procedures and make a copy of this flight test plan part of the aircraft's certification file.

Phase I Test Pilot Qualifications

NTSB analyses of E-AB accidents occurring in 2011 found that 34 of the 227 E-AB accident aircraft were conducting Phase I flight test operations. The aircraft builder was the test pilot in 29 of these 34 accidents. The accident pilots' median total flight time was 1,000 hours, but the median experience in the accident make and model was only 4 hours. The NTSB concludes that E-AB aircraft safety could be improved by providing pilots with additional training and guidance to safely perform Phase I test pilot functions.

The EAA, many kit manufacturers, and type clubs provide guidance and training directed toward the development and conduct of a flight test plan and the preparation of an aircraft flight manual. The EAA, for example, offers a two-day Sport Aviation Workshop course titled *Test Flying & Developing Pilot Operating Handbook*.⁷ The focus of this course is to assist the builder/pilot to safely explore the aircraft's flight envelope, gather and interpret flight test data, and develop the aircraft flight manual. Therefore, the NTSB recommends that the FAA identify and apply incentives to encourage owners, builders, and pilots of experimental amateur-built aircraft to complete flight test training, such as that available in the Experimental Aircraft Association's *Test Flying and Developing Pilot Operating Handbook*, prior to conducting flight tests of experimental amateur-built aircraft. The NTSB has issued a similar recommendation to the EAA.

Additional Persons Onboard During Phase I Flight Testing

FAA Order 8130.2G currently prohibits anyone other than the pilot, unless that other person is essential to the purpose of the flight, to occupy an aircraft during the Phase I flight test period. In two of the study accidents during 2011 involving E-AB aircraft Phase I flight test operations, there were two individuals aboard the accident aircraft, in apparent conflict with the operating limitation that, "During the flight testing phase, no person may be carried in this aircraft during flight unless that person is essential to the purpose of flight." While FAA Order 8130.2G does not precisely define "essential to the purpose of flight," it is generally understood that this provision does not encompass training of the E-AB aircraft builder. However, the NTSB believes that the safety of E-AB aircraft flight testing could be improved for some pilots and flight test circumstances if a qualified second pilot was authorized to accompany the pilot for the purpose of flight testing and not training. Other countries specify provisions for more than one pilot to occupy an aircraft during flight testing.

⁷ <http://www.sportair.com/schedule.html>.

FAA AC 20-27G contains language indicating that an additional crewmember can be added to the aircraft operating limitations; however, no related guidance is provided to ASIs or DARs in FAA Order 8130.2G. Providing pilots with a clearly defined policy regarding the presence of a second pilot would enhance flight safety during portions of the flight test program that simultaneously demand high levels of piloting skill and the capture of necessary flight test data. Therefore, the NTSB recommends that the FAA revise Order 8130.2G, and related guidance or regulations, as necessary, to clarify those circumstances in which a second qualified pilot could be authorized to assist in the performance of flight tests when specified in the flight test plan and Phase I operating limitations.

Documenting Results of Phase I Flight Testing

FAA Order 8130.2G states that an explicit flight test program must be accomplished before E-AB aircraft issued an airworthiness certificate and Phase I operating limitations can enter the less restrictive Phase II operating limitations. FAA Order 8130.2G further states that flight test programs serve two purposes:

They ensure the aircraft has been adequately tested and determined to be safe to fly within the aircraft's flight envelope.

The flight test data is used to develop an accurate and complete aircraft flight manual and to establish emergency procedures.

The owner/builder's self-endorsement in the aircraft logbook and maintenance records, stating that the prescribed flight hours were completed, is the only explicit evidence that the aircraft has been shown to comply with 14 CFR 91.319(b). There is no requirement that the ASI or DAR confirm this claim.

In addition to the guidance provided by FAA AC 90-89A, the EAA, many kit manufacturers, and type clubs also provide guidance and training directed toward the development and conduct of a flight test plan and the preparation of an aircraft flight manual. One of EAA's Sport Aviation Workshops, for example, is a two-day course titled *Test Flying & Developing Pilot Operating Handbook*. FAA AC 90-89A advises builders that:

It is imperative a flight manual describing the anticipated performance of the aircraft be written by the aircraft builder/kit manufacturer. The manual will be revised several times during the flight test phase until it accurately reports the aircraft's performance.

The NTSB concludes that because no mechanism, other than the builder's self-certification, currently exists to ensure that the aircraft has been adequately tested and determined to be safe to fly within the aircraft's flight envelope or that the flight test data is used to develop an accurate and complete aircraft flight manual and to establish emergency procedures, it is likely that these flight test objectives are not achieved for some E-AB aircraft. The NTSB further concludes that the risk of E-AB aircraft accidents could be reduced by verifying that all E-AB aircraft are adequately tested according to a flight test plan, and that the resulting test data are used to create an accurate and complete aircraft flight manual. Therefore, the NTSB recommends that the FAA revise Order 8130.2G, and related guidance or regulations,

as necessary, to require the review and acceptance of the completed test plan documents and aircraft flight manual (or its equivalent) that documents the aircraft's performance data and operating envelope, and that establishes emergency procedures, prior to the issuance of Phase II operating limitations.

Use of Recorded Data for Phase I Flight Testing and Continued Airworthiness

FAA AC 90-89A describes, in general terms, the tests to be performed to explore the aircraft's flight envelope, but does not prescribe specific parameters to be measured or data to be collected. Since FAA AC 90-89A was published on May 24, 1995, a number of technological improvements to such data collection have been introduced. Citing these data recording capabilities in its 2010 safety study of the introduction of glass cockpit avionics into light aircraft,⁸ the NTSB concluded, "Some glass cockpit displays include recording capabilities that have significantly benefited accident investigations and that provide the general aviation community with the ability to improve equipment reliability and the safety and efficiency of aircraft operations through data analyses."

Similarly, a number of manufacturers make electronic flight information systems and primary flight displays that provide capable and sophisticated electronic recording of airplane performance and engine parameters that can greatly facilitate the collection of data needed to carefully map the E-AB aircraft's flight envelope and performance characteristics. Glass cockpit avionics were reported by 16 percent of EAA survey respondents who had bought used aircraft, 35 percent of respondents who had finished building their E-AB aircraft, and 58 percent of respondents who were in the process of building their aircraft. Among the 2011 accident aircraft, 34 percent of the built-by-owner aircraft were equipped with glass cockpit instruments compared with 14 percent of the bought-used accident aircraft.

The NTSB concludes that data obtained from glass cockpit avionics, electronic flight instruments, or other recording devices can significantly enhance the efficient accomplishment of flight test objectives, as well as the monitoring of parameters important to the continuing airworthiness of the E-AB aircraft, provided that they are demonstrated to be precise and reliable, record at sufficiently high sampling rates, and are easily downloaded by the aircraft owner. Therefore, the NTSB recommends that the FAA revise AC 90-89A, *Amateur-Built Aircraft and Ultralight Flight Testing Handbook*, to include guidance for the use of recorded flight data for the purposes of flight testing and maintaining continued airworthiness of experimental aircraft. The NTSB further recommends that once developed, the FAA revise Order 8130.2G, and related guidance or regulations, as necessary, to include provisions for the use of electronic data recordings from electronic flight displays, engine instruments, or other recording devices in support of Phase I flight testing of E-AB aircraft to document the aircraft performance data and operating envelope and develop an accurate and complete aircraft flight manual.

⁸ National Transportation Safety Board. 2010. *Introduction of Glass Cockpit Avionics into Light Aircraft*. Safety Study NTSB/SS-10/01. Washington, DC. Available: <http://www.nts.gov/doclib/safetystudies/SS1001.pdf>.

Transition Training

NTSB analyses indicated that the largest proportion of fatal E-AB aircraft accidents involved loss of aircraft control in flight. The study identified several opportunities to reduce loss of control accidents by improving pilots' access to training prior to flying an E-AB aircraft, and ensuring that pilots have the performance information necessary to safely operate their E-AB aircraft.

The FAA and the EAA, as well as several E-AB aircraft kit manufacturers and aircraft type clubs, strongly encourage specific training for pilots transitioning to E-AB aircraft and provide information and resources to support this training. Analysis of responses to the EAA survey of E-AB aircraft owners and builders indicates that 1,499 (58 percent) of the 2,583 respondents who built their E-AB aircraft and who answered the question reported some type of transition training prior to their first flight. In contrast, NTSB investigators found evidence of a transition training requirement for only 19 of the 227 pilots of E-AB accident aircraft investigated in 2011. While the lack of evidence for transition training may underestimate the actual incidence of such training, the reported proportion is strikingly low. The NTSB concludes that the difference between the EAA survey respondents and the 2011 accident pilots suggests that pilots who did not seek training were overrepresented in the accidents, and that E-AB aircraft accidents involving loss of aircraft control could be reduced if more pilots received transition training.

During focus group discussions with NTSB investigators, members of the E-AB aircraft builders community identified regulations regarding the use of experimental aircraft as limiting pilot's access to transition training. Specifically, they referred to limitations in 14 CFR 91.319, which states:

(a) No person may operate an aircraft that has an experimental certificate— (1) For other than the purpose for which the certificate was issued; or (2) Carrying persons or property for compensation or hire.

Guidance to FAA inspectors in FAA Order 8900.1⁹ explicitly states that the term “crew training” in section 21.191 does not permit for-hire pilot flight training. However, 14 CFR 91.319(h) permits the FAA to issue a Letter of Deviation Authority (LODA) to an applicant for the purpose of conducting flight training in an experimental aircraft.

Based on discussions with members of the EAA Builder's Council, E-AB aircraft builders, kit manufacturers and type club representatives, the NTSB concludes that the guidance currently available to qualified E-AB aircraft owner/instructors to obtain a LODA to conduct flight training is deficient and variable from one FAA region to another. The NTSB also concludes that the difficulty of finding suitable E-AB aircraft and instructors available for training presents a barrier to pilots seeking transition training. Therefore, the NTSB recommends that the FAA develop and publish an advisory circular, or similar guidance, for the issuance of a

⁹ FAA Order 8900.1, *Flight Standards Information Management System (FSIMS) CHG 155*, May 24, 2011, Use of Aircraft Issued Experimental Certificates in Flight Training for Compensation or Hire, http://fsims.faa.gov/wdocs/8900.1/v03%20tech%20admin/chapter%2011/03_011_001.pdf.

LODA to conduct flight instruction in an experimental aircraft, to include sample documentation and sample training materials.

Voluntary Efforts to Promote Transition Training

In the summer of 2011, representatives of the EAA, pilot groups, and owner type clubs announced the intention to form a coalition to improve safety. One of the planned efforts is to specifically seek out pilots transitioning to new aircraft to notify them of model-specific safety information and how to obtain transition training.¹⁰ The NTSB acknowledges that the development of guidance materials and related regulatory actions will likely require considerable time. However, voluntary efforts, such as the planned creation of a coalition of kit manufacturers, could assist in the promotion of transition training in the interim. Therefore, the NTSB recommends to the FAA and the EAA that they complete planned action to create a coalition of kit manufacturers, type clubs, and pilot and owner groups and (1) develop transition training resources and (2) identify and apply incentives to encourage both builders of E-AB aircraft and purchasers of used E-AB aircraft to complete the training that is developed.

Providing Information to Purchasers of Used E-AB Aircraft

In FAA AC 90-109, the FAA states that:

The new buyer of an experimental airplane may not fully understand the challenges of transitioning to a new airplane, particularly one which has characteristics outside his or her previous aviation experience.

Fifty-five percent (125 of 227) of the 2011 E-AB accident aircraft had been bought used. The NTSB concludes that purchasers of used E-AB aircraft face particular challenges in transitioning to the unfamiliar E-AB aircraft. Like builders of new E-AB aircraft, they must learn to manage the unique handling characteristics of their aircraft, but they must also learn the systems, structure, and equipment without the firsthand knowledge afforded to the builder. In this regard, FAA AC 90-109 states that, to become familiar and competent in the new airplane, pilots should follow an organized methodology that includes the systems, procedures, performance, and limitations applicable to their aircraft. But this guidance includes a caution that:

Even in simple airplanes of a similar design or even the same model, the innovation of individual designers and builders may cause problems for a pilot new to the airplane.

Pilots of type-certificated aircraft have access to the applicable aircraft and systems information in the *Pilot's Operating Handbook* developed by the airplane manufacturer, which contains the FAA-approved aircraft flight manual. Unless the original builder of an E-AB aircraft creates similar materials during the course of aircraft flight testing, a subsequent owner may not have the detailed aircraft information necessary to support safe operation during transition to the aircraft and subsequent operation of the aircraft. The NTSB concludes that accidents included in this report indicate that not all builders of E-AB aircraft create a detailed aircraft flight manual during Phase I flight testing. The NTSB also concludes that absent an appropriate aircraft flight

¹⁰ http://www.airventure.org/news/2011/110729_type_clubs.html.

manual, purchasers of used E-AB aircraft are not provided with sufficient information to understand the aircraft's controllability throughout all maneuvers, to detect any hazardous operating characteristics, or to understand emergency procedures.

Therefore, the NTSB recommends that the FAA revise 14 *Code of Federal Regulations* 47.31 and related guidance or regulations, as necessary, to require the review and acceptance of aircraft operating limitations and supporting documentation as a condition of registration or re-registration of an experimental amateur-built aircraft. The NTSB also recommends that the FAA revise Order 8130.2G, and related guidance or regulations, as necessary, to include provisions for modifying the operating limitations of aircraft previously certificated as experimental, operating amateur-built, such as returning the aircraft to Phase I flight testing, as necessary, to address identified safety concerns or to correct deficiencies in the aircraft flight manual or equivalent documents.

Accurate Identification of Amateur-Built Aircraft

Finally, the E-AB study found problems related to the accurate identification of E-AB, and the aircraft make and model, that currently make effective E-AB aircraft safety oversight difficult. Unlike a type-certificated aircraft, when a builder registers an amateur-built aircraft, he/she is free to choose a manufacturer and model name to identify their aircraft regardless of the aircraft design. Incorrect identification of E-AB aircraft in NTSB accident records has affected the tracking and analysis of E-AB aircraft safety issues and the problem has increased since the introduction of the special light-sport and experimental light-sport certification categories.

The ability to accurately identify E-AB aircraft built from a kit or from plans of a recognized design would be greatly improved if the FAA Civil Aircraft Registry database were modified to capture aircraft manufacturer, make, and model.¹¹ Although the terms are often used interchangeably, manufacturer and make are not synonymous. With regard to aircraft, "make" identifies an aircraft design and "manufacturer" identifies the entity that constructs an aircraft.

The inability to identify the aircraft design in the FAA Civil Aircraft Registry limits the ability to conduct safety analyses and hampers notification of E-AB aircraft owners in the event that an aircraft- or engine-specific issue is ever identified. The NTSB concludes that accurate identification of experimental amateur-built aircraft would greatly improve the ability to assess the continued safety of experimental aircraft and identify design-specific safety issues.

Therefore, the NTSB recommends that the FAA revise the Civil Aircraft Registry database to include a means of identifying E-AB aircraft manufacturer, make, model, and series—such as the aircraft make, model, and series classification developed by the CAST/ICAO Common Taxonomy Team—that unambiguously identifies the aircraft kit or plans design as well as the builder of the aircraft.

¹¹ The NTSB identified similar concerns regarding identification of E-AB aircraft kits owners in its August 29, 1997 Safety Recommendation letter to the FAA (A-97-53, "Closed—Acceptable Action," December 1998).

Therefore, based upon the findings and conclusions in the E-AB study, the National Transportation Safety Board makes the following recommendations to the Federal Aviation Administration:

Revise 14 *Code of Federal Regulations* 21.193, Federal Aviation Administration Order 8130.2G, and related guidance or regulations, as necessary, to define aircraft fuel system functional test procedures and require applicants for an airworthiness certificate for a powered experimental, operating amateur-built aircraft to conduct that test and submit a report of the results for Federal Aviation Administration acceptance. (A-12-28)

Revise 14 *Code of Federal Regulations* 21.193, Federal Aviation Administration Order 8130.2G, and related guidance or regulations, as necessary, to require applicants for an airworthiness certificate for experimental, operating amateur-built aircraft to submit for Federal Aviation Administration acceptance a flight test plan that will (1) ensure the aircraft has been adequately tested and has been determined to be safe to fly within the aircraft's flight envelope and (2) produce flight test data to develop an accurate and complete aircraft flight manual and to establish emergency procedures and make a copy of this flight test plan part of the aircraft's certification file. (A-12-29)

Identify and apply incentives to encourage owners, builders, and pilots of experimental amateur-built aircraft to complete flight test training, such as that available in the Experimental Aircraft Association's *Test Flying and Developing Pilot Operating Handbook*, prior to conducting flight tests of experimental amateur-built aircraft. (A-12-30)

Revise Federal Aviation Administration Order 8130.2G, and related guidance or regulations, as necessary, to clarify those circumstances in which a second qualified pilot could be authorized to assist in the performance of flight tests when specified in the flight test plan and Phase I operating limitations. (A-12-31)

Revise Federal Aviation Administration Order 8130.2G, and related guidance or regulations, as necessary, to require the review and acceptance of the completed test plan documents and aircraft flight manual (or its equivalent) that documents the aircraft's performance data and operating envelope, and that establishes emergency procedures, prior to the issuance of Phase II operating limitations. (A-12-32)

Revise Federal Aviation Administration Advisory Circular 90-89A, *Amateur-Built Aircraft and Ultralight Flight Testing Handbook*, to include guidance for the use of recorded flight data for the purposes of flight testing and maintaining continued airworthiness of experimental aircraft. (A-12-33)

Revise Federal Aviation Administration Order 8130.2G and related guidance or regulations, as necessary, to include provisions for the use of electronic data recordings from electronic flight displays, engine instruments, or other recording devices in support of Phase I flight testing of experimental amateur-built aircraft to document the aircraft performance data and operating envelope and develop an accurate and complete aircraft flight manual. (A-12-34)

Develop and publish an advisory circular, or similar guidance, for the issuance of a Letter of Deviation Authority to conduct flight instruction in an experimental aircraft, to include sample documentation and sample training materials. (A-12-35)

Complete planned action to create a coalition of kit manufacturers, type clubs, and pilot and owner groups and (1) develop transition training resources and (2) identify and apply incentives to encourage both builders of experimental amateur-built aircraft and purchasers of used experimental amateur-built aircraft to complete the training that is developed. (A-12-36)

Revise 14 *Code of Federal Regulations* 47.31 and related guidance or regulations, as necessary, to require the review and acceptance of aircraft operating limitations and supporting documentation as a condition of registration or re-registration of an experimental amateur-built aircraft. (A-12-37)

Revise Federal Aviation Administration Order 8130.2G, and related guidance or regulations, as necessary, to include provisions for modifying the operating limitations of aircraft previously certificated as experimental, operating amateur-built, such as returning the aircraft to Phase I flight testing, as necessary, to address identified safety concerns or to correct deficiencies in the aircraft flight manual or equivalent documents. (A-12-38)

Revise the Civil Aircraft Registry database to include a means of identifying aircraft manufacturer, make, model, and series—such as the aircraft make, model, and series classification developed by the CAST/ICAO Common Taxonomy Team—that unambiguously identifies the aircraft kit or plans design as well as the builder of the aircraft. (A-12-39)

The NTSB also issued four recommendations to the Experimental Aircraft Association. In response to the recommendations in this letter, please refer to Safety Recommendations A-12-28 through -39. We encourage you to submit updates electronically at the following e-mail address: correspondence@ntsb.gov. If your response includes attachments that exceed 5 megabytes, please e-mail us at the same address for instructions. To avoid confusion, please do not submit both an electronic copy and a hard copy of the same response.

Chairman HERSMAN, Vice Chairman HART, and Members SUMWALT, ROSEKIND, and WEENER concurred in these recommendations.

[Original Signed]

By: Deborah A.P. Hersman
Chairman