

Standing Committee on Aircraft / Airport Compatibility (AV070)
Ernie Heymsfield, Chair

We Design to Make it Land Safely: Aircraft and Airport Compatibility

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YESTERDAY

In 1975, the Transportation Research Board (TRB) established the Special Committee on Air Transport Activities, Figure 1. Multiple committees were established under the guidance of the Special Committee on Air Transport Activities to address the research needs and challenges facing aviation. The first committee organized was the Airport Landside Operations Committee in 1976. Two committees along with a Task Force were added in 1977 and one committee was added in 1978. In 1979, the Aircraft / Airport Compatibility Committee along with the Air Transport Operations and Maintenance were added. Consequently, this year the Aircraft / Airport Compatibility is celebrating its 40th anniversary as a TRB technical committee. The Aircraft / Airport Compatibility committee has a rich history over its 40 year lifespan. Currently known as AV070, the committee began in 1979 as A3A16. TRB established the Aviation Section in 1984 and A3A16 was changed to A1J07. The Aircraft / Airport Compatibility committee took on its current code name, AV070, in 2003 after the Aviation Section reorganized into the current Aviation Group. The Aviation Group now consists of nine standing technical committees. In 2012, the Aircraft / Airport Compatibility Committee established a joint subcommittee with the Geographic Information Science and Applications Committee (ABJ60), on Computer-Aided Design and Geographic Information Systems. The subcommittee is co-chaired by Mark Ricketson of Woolpert and Randy Murphy of Arora Engineers, Inc. The subcommittee has hosted workshops at the TRB Annual Meeting exploring subjects such as big data collection and storage, LIDAR and point clouds, and e-Airport Layout Plans. At the beginning of this millennium, AV070 helped to promote the concept of having a funded research program to support research areas that were not currently being addressed by federal agencies. This concept saw fruition in 2005 with the Airport Cooperative Research Program (ACRP). Figure 1 is a timeline of events relevant to the Aircraft / Airport Compatibility Committee over its 40 years of existence.

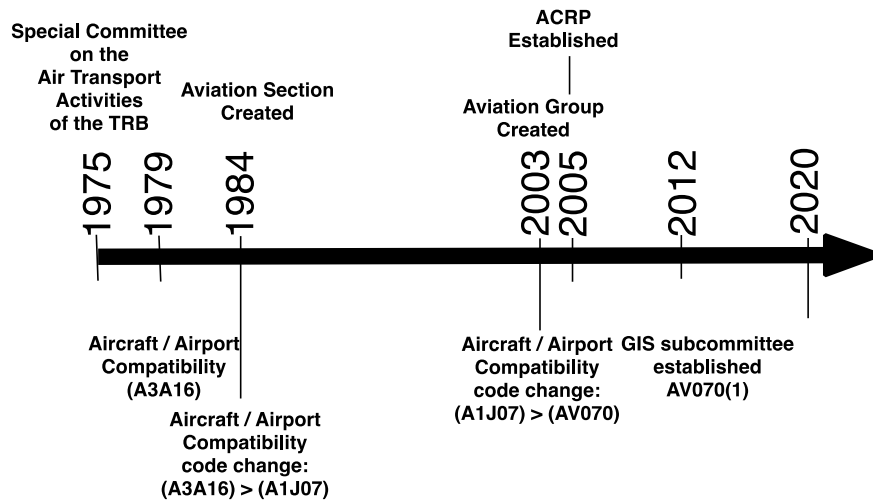


Figure 1. AV070 Timeline

Ten chairmen have led the Aircraft / Airport Compatibility Committee over its 40 years, Table 1.

Table 1. Aircraft / Airport Compatibility Past Chairs

| Term | Name | Company |
|--------------|------------------|-----------------------------------|
| 1979-1981 | William Parsons | The Boeing Company |
| 1981-1987 | D. Conner | |
| 1987-1990 | Barry Myers | Transportation Development Center |
| 1990-1991 | Norman Witteveen | |
| 1991-1994 | F. Madgwick | HNTB Corporation |
| 1994-1998 | John West | California Dept. of Trans |
| 1998-2005 | Michael McNerney | DMJM Aviation |
| 2005-2011 | Amiy Varma | North Dakota State Univ. |
| 2011-2017 | Geoffrey Baskir | FAA |
| 2017-Current | Ernie Heymsfield | Univ. of Arkansas |

Committee Scope

The committee's scope and objectives have evolved over the committee's existence, however has stayed true to the committee's major goal of research related to ensuring that airports and aircraft remain compatible.

The committee scope in 2000 was:

“The Committee is concerned with the development and application of techniques for analyzing the interface of civil aircraft with airport and airport environs. The committee's work focuses on research and development of aircraft operational and design factors, particularly as those related to: operational efficiency, airport capacity, security, safety, and on-airport environment.”

The committee goals included:

- anticipate future problems and develop research projects to address these needs;
- identify existing problems and/or technology needs and respond with appropriate research;

- identify and promote emerging technologies; and
- disseminate available information that will improve aircraft/airport compatibility

The committee scope was broadened in 2003 by expanding the 2000 scope to include: “and for providing a basis for decisions concerning design and operations of aircraft and airports that are compatible, integrated and cost-effective.” The next committee scope modification was made in 2011 to include safe and sustainable, so that the AV070 scope statement became:

“The committee is concerned with the development and application of techniques for analyzing the interface of civil aircraft with the airport and its environs and for providing a basis for decisions concerning design and operations of aircraft and airports that are safe, compatible, integrated, cost-effective and sustainable.”

This scope statement summarizes the overarching purposes for the existence of the Aircraft / Airport Compatibility committee and identifies the current AV070 committee scope.

Committee Membership

The Aircraft / Airport Compatibility committee has transformed from being heavily comprised of members from the DC area to having a more uniform representation throughout the country and internationally. In 2000, the AV070 was comprised of 22 members in which 8 members were from the Washington, DC area and with no representation from outside the US. An international member was added to the committee in 2003. The current AV070 roster includes 23 main members, 4 international members, and 4 young members. Members from more geographical regions of the U.S. are included on the roster. In addition to the US, seven countries are represented on the current AV070 roster. Within the AV070 committee structure, AV070 has enjoyed a highly involved membership.

TRB Annual Meeting

Six committee members attended the 2000 TRB Annual Meeting along with 11 other attendees.

The Aircraft / Airport Compatibility Committee reviewed 7 papers for the 2000 TRB Annual meeting and 2 papers in 2000. This number increased to 9 papers for the 2004 Annual Meeting. AV070's involvement with the TRB Annual Meeting has continued to increase, so that 22 papers were reviewed for the 2015 Annual Meeting. A high water mark was reached for the 2018 Annual Meeting when 31 papers were reviewed for presentation and publication. The AV070 meeting at the most recent TRB Annual Meeting in 2019 had 21 members and a total of 54 attendees. The AV070 reviewed 19 papers for this Annual Meeting.

TODAY

The “Yesterday” AV070 through its leadership and membership has created a firm foundation for the “Today” AV070. AV070 remains true to its scope statement to research and disseminate information. The committee continues to address the challenges that the aviation industry faces to move more people, more miles, while minimizing cost and ensuring safety. These challenges are being addressed as airport airside infrastructure continues to evolve to cater to a changing aircraft fleet.

Today's AV070 Committee Membership

Today, AV070 is comprised of 23 main members, 4 international members and 4 young members. This membership includes industry, consulting, academia, military, and government. The members represent various regions of the US, however is still weighted towards the east coast. In

addition to the US, AV070 has representation from 7 countries. Six committee members are women. A member represents the Federal Aviation Administration. In addition, both major aircraft companies, Airbus and Boeing, are represented through AV070 membership. Graduate students participating in ACRP programs have been given the opportunity and have been encouraged to present at AV070 sponsored lectern sessions, poster sessions, and at the AV070 committee meeting. It is hoped that by including graduate students in these opportunities, these young adults, along with their advisors, will seek future involvement with the AV070. The AV070 includes a committee communications coordinator (CCC), Gael LeBris, and a Committee Research Coordinator (CRC), Joseph Daniels. The AV070 CCC promotes communication within the committee and between the TRB technical committees, primarily within the AV000 group. The AV070 CRC ensures that the AV070 stays true to its primary mission to conduct and disseminate research information.

The AV070(1) Subcommittee for GIS and Data, is active and is currently co-chaired by Mark Ricketson and Randy Murphy. The AV070(1) subcommittee meets annually during the TRB Annual Meeting.

AV070 Midyear Meeting

In addition to the Aircraft / Airport Compatibility Committee meeting during the TRB Annual Meeting, the committee in 2014 started having a face-to-face midyear meeting. These midyear meetings have been coordinated with the American Society of Civil Engineers (ASCE) during ASCE conferences that pertain to airport operations and airfield pavements. The timing of the AV070 midyear meeting has been made to encourage collaboration between the AV070 and ASCE aviation technical committees.

ACRP Involvement

The ACRP problem statement submittal process dramatically changed in 2018 with ACRP adopting the online submittal portal, IdeaHub. The AV070 responded to this submittal process change and challenge by walking the AV070 membership through the IdeaHub protocol and addressing AV070 member questions. The AV070 is committed to help its committee membership to submit problem statements to ACRP that address research needs of the aviation industry.

The AV070 remains active in helping review ACRP problem statements. In 2018, the AV070 membership reviewed 15 problem statements submitted to the ACRP.

TOMORROW

The future aviation world is an unknown, but those involved in aviation research will have the exciting opportunity to shape it. Consequently, the AV070 has an opportunity to shape this new and unknown aviation world. Although the specifics will change, AV070 will continue to remain true to its five major goals to:

- provide research opportunities to the AV070 community;
- disseminate research information to the aviation world;
- share research information within the AV070 and outside;
- implement new research; and
- identify what research gaps exist.

Collaboration with Other Groups

In future years, the Aircraft/Airport Compatibility Committee (AV070) will do more to expand its outreach to other segments of the aviation community. Beyond the American Society of Civil Engineers, opportunities exist for the Committee to work together and plan events with other aviation organizations that will be mutually beneficial to the AV070 membership.

Figure 2 identifies committees within the TRB and ASCE that AV070 will seek future collaboration with.

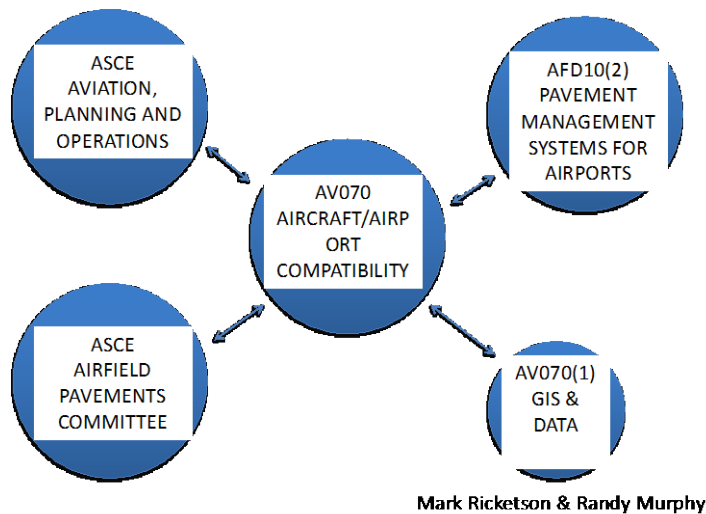


Figure 2. AV070 Collaboration with Other Committees

Social media has disrupted how technology is communicated and shared. The AV070 CCC will be taking on a greater role within the committee to optimize communication within the AV070, within TRB, and outside of TRB.

Although Federal Aviation Administration guidelines are more pertinent to the AV070 community, the AV070 will seek the opportunity to provide professional expertise internationally through involvement in the International Civil Aviation Organization (ICAO) in establishing safe and efficient air travel internationally.

Future Research

Evolving technology will change aircraft size, aircraft types, aircraft land movements, and airport airside safety. Technology will provide opportunity to transport more people within a shorter time period. The growing usage of Unmanned Aerial Vehicles (UAVs) will impact the airside design of airports. The immediate challenge will be the interaction between manned and unmanned aircraft, and required infrastructure to support UAVs. Changing aircraft types will necessitate the need for rethinking airfield pavement materials and pavement structure design to ensure safety and extended pavement design life.

Examples of Future Research

Key trends affecting the direction of airport pavement design and evaluation research include continuing the long-term trend toward rational analysis of pavement structures based on engineering mechanical principles. A current example of this trend is the pavement rating system. The current system for rating an aircraft classification system compares the aircraft classification

number (ACN) with the pavement classification number (PCN). This protocol for pavement rating is being revised to use an Aircraft Classification Rational (ACR) number and a Pavement Classification Rational (PCR) number. This new ACR-PCR protocol will be introduced gradually in the next few years. Future airfield pavement design trends will include a greater reliance on long-term pavement performance data to supplement simple structural analysis and design. Including long-term pavement performance data will provide a reference for extending pavement design life to beyond 20 years and to more accurately predict remaining pavement life. Computationally, pavement structure design will incorporate artificial intelligence (AI) based solutions using artificial neural networks (ANNs). ANNs will accelerate the computational speed required for rigid pavement design and incorporate important failure modes (such as top-down cracking) that are currently not being fully acknowledged. In addition to AI, technology will enable applying big data analytical methods to the performance prediction problem by incorporating a very large data pool including: time, traffic, weather, frequency of maintenance activities, etc.

More accurate metrics for defining material properties will need to be found as well as metrics for material quality. Consequently, how these values are attained will need to be improved. The pavement thickness design procedure and pavement life predictions are a function of actual material properties, such as the hot mix asphalt (HMA) modulus at design temperatures, resilient modulus and shear strength of soils, and unbound materials. High tire pressure loads accompany new larger aircraft. In response, research efforts are underway to develop performance related specifications (PRS) for airport pavement materials considering high- pressure loads. Improving how pavement material is quantified and analyzed will lead to: improving pavement durability, extending airport pavement life, reducing lifecycle costs, better predicting pavement service life, and more accurately assessing aircraft-pavement compatibility.

SUMMARY

The Aircraft / Airport Compatibility Committee has experienced a rich 40 year history within the umbrella of the TRB Aviation Group. The Committee has enjoyed a tenure of strong leadership with a committed membership base. With the ever changing aviation world, AV070 expects to continue in providing a forum for aviation researchers to meet, discuss, and promote aviation research.

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