

## BIOGRAPHIES OF AUTHORS

The compilation of this AGARDograph was possible only by the enthusiastic work of an international group of wind tunnel experts. The editor has to thank each of them for the engagement he invested in this work to the benefit of present and future wind tunnel engineers and aerodynamicists all over the world. We have to testify deepest respect to the authors of AGARDograph 109, who pioneered the subject of wind tunnel wall corrections and with their early effort in the end encouraged us to compile AGARDograph 336. Finally, we have to thank the AGARD Fluid Dynamics Panel who initiated and supported this work.

### Patrick Ralph Ashill, PhD

#### Education :

1956-1959 University of Southampton, B Sc(Eng) Degree awarded June 1959

1960 - 1962 College of Aeronautics, Cranfield, MSc Degree awarded in 1972

1963 - 1968 External student University of Southampton, PhD Degree awarded June 1968

Member AIAA, Fellow of the Royal Aeronautical Society, Silver Medal of the Royal Aeronautical Society, awarded December 1996.

#### Career :

1962 -1969 : After completing a postgraduate course in aerodynamics at the College of Aeronautics, Cranfield, in 1962, invited to join the staff of the College as a Research Assistant and later as a Senior Research Fellow. Main task was to perform theoretical and experimental (wind tunnel) research on wings in ground effect, but also assisted with teaching.

1969-Present : Joined the Royal Aircraft Establishment (RAE), which became the Defence Evaluation and Research Agency (DERA) in 1997. Have been involved in the study of high-lift wings, wind-tunnel wall interference, boundary-layer transition, active and passive control of shock waves and separation control. Have also performed research into transonic scale effects and methods for calculating viscous transonic flows over aerofoils and wings. Currently, hold the position of DERA Fellow (formerly known as Senior Principal Scientific Officer (Individual Merit)).

#### Additional information:

Have chaired sessions at ICAS Jerusalem in 1988 on wind-tunnel wall interference, ICAS Anaheim in 1994 on wind tunnel test techniques and laminar flow and at a CEAS (Confederation of European Aeronautical Societies) symposium at Southampton University in 1992.

Was a member of two GARTEur working Groups between 1980 and 1983 concerned with transonic wind-tunnel test techniques and the validation of CFD methods for predicting transonic flows over wings.

Was a member of the AGARD Working Group 14 'Experimental test Cases for CFD Validation', which reported its findings in 1994 (AGARD-AR-303). Was chairman of a sub group concerned with defining requirements for validation experiments.

### Travis Binion

#### Education :

B.S., Mechanical Engineering, Texas Tech University, 1957

M.S., Mechanical engineering, University of Tennessee, 1971

#### Career :

Mr. Binion has 40 years of experience in engineering/management of research, development, and testing in flight dynamic facilities. He is internationally recognised for his contributions toward understanding the test methodology and wind tunnel environment factors that affect the quality of transonic test data. He has performed and published research over a broad base of technologies including engine/inlet

compatibility, missile base heating and jet/body interactions, wind tunnel wall interference, test section wall configurations, and rocket and turbojet engine simulators for wind tunnel testing.  
*He is presently happily semi-retired where ever he happens to be.*

## **Kevin Russell Cooper**

### **Education:**

B.A., General Arts, University of Western Ontario, 1964.

B.Sc., Honours Physics, University of Western Ontario, 1967 (Dean's Honours List).

M.A.Sc., Subsonic Aerodynamics, University of Toronto Institute for Aerospace Studies, 1968.

### **Career :**

1968 - present: Research Officer, Applied Aerodynamics Laboratory, National Research Council of Canada

1983 - 1984: Guest Worker, Cranfield Institute of Technology, U.K.

1987 - 1990: Manager, 9m x 9m Wind Tunnel, National Research Council of Canada

1991-1997 Group Head of General Aerodynamics and Wind Tunnel Facility Manager

Kevin Cooper worked in the field of sub-sonic aerodynamics since 1968. The focus was the steady and the unsteady aerodynamics of bluff bodies and the effects of aerodynamic forces on both the dynamic stability and the response to unsteady wind loads of a broad range of systems from road vehicles to bridges. Since that time he was involved in wind tunnel investigations of almost all types of civil engineering structures and of almost all types of transportation systems. He organised and was involved in international correlation studies of wind tunnel measurements on surface vehicles and buildings that have required me to work in many wind tunnels in Canada, the United States and Europe.

He worked primarily as a consultant for Canadian and foreign Industry on projects that have solved real industrial problems or have developed real products. He also provided technical support for the testing of aircraft models in the 2m x 3m and the 9m wind tunnels of the NRC in the areas of wall corrections and measurement and test technology.

*I have served as the manager of the 9m x 9m wind tunnel and of the General Aerodynamics Group of the Aerodynamics Laboratory. In this latter position, I have managed the low-speed wind tunnel facilities at the Montreal Rd site of the NRC.*

Currently, I have returned to my research activities and have just completed a major study of an automotive diffuser in ground effect, to better understand the capabilities of diffusers for road and racing applications, and to examine the role of the moving belt in each case. This program will continue as part of the development of novel moving-belt facilities in the model-scale 2m x 3m wind tunnel and in the full-scale 9m x 9m wind tunnel.

### **Additional Information :**

SAE Excellence in Oral Presentation Award, 1990. Gzowski Society Lecture, London, Ont., 1989

Presidents medal for the best Technical paper from the Roads and Transportation Association of

Canada, 1977. Member: SAE Road Vehicle Aerodynamics Committee. Member: SAE Wind Tunnel

Testing Methods Subcommittee. Chairperson: SAE Wind Tunnel Boundary Corrections Subcommittee

Chairperson: SAE Truck and Bus Aerodynamics Subcommittee. Member: Executive member of the Canadian Wind Engineering Association

## **Roger Crites**

### **Education :**

Bachelor of Aeronautical and Astronautical Engineering from the Ohio State University.  
Master of Science in Mechanical Engineering from the University of Missouri-Rolla.

### **Career :**

Mr. Crites is a Research and Engineering Fellow of the Boeing Company (previously McDonnell Douglas Corporation). He is also an Associate Fellow of the AIAA. During thirty years of service, he has published over 30 technical papers, obtained multiple patents, and received many awards and honours for outstanding technical contributions to wind tunnel technology. Mr. Crites directs a high performance research team that is dedicated to providing new technology, enabling major reductions in the cost and cycle time associated with wind tunnel testing. Current activities are focused on wall interference reduction and correction, advanced wind tunnel instrumentation, (such as pressure sensitive paint), and statistical applications to quality, productivity, and optimal test design.

## **Dr. Joel L. Everhart**

### **Education :**

BS (1973) in Aerospace Engineering and MS (1975) in Mechanical Engineering from North Carolina State University. D.Sc. (1988) in Fluid Mechanics from George Washington University.

### **Career :**

Dr. Everhart has been employed at NASA Langley Research Center as a Research Engineer since July 1977. He is a Senior Member of the AIAA and has authored and co-authored over 30 technical publications. His primary research interests are in areas related to wind tunnel wall interference, wind tunnel calibrations, instrumentation accuracy, statistical quality control and data quality, and testing techniques at subsonic and transonic speeds. He has also conducted research in shock/boundary layer interactions and propulsion/airframe integration at hypersonic speeds. He is presently a member of the Research Facilities Branch, Aero- and Gas-Dynamics Division.

## **Prof. Dipl.-Ing. Bernd F.R. Ewald**

### **Education :**

1952-1959 Studied Aeronautical Engineering at the Technical University of Aachen, Germany..

### **Career :**

1960 - 1962	Aeroplane Design Engineer at the Prof. Blume Leichtbau und Flugtechnik Company
1962 - 1965	Experimental Aerodynamicist at Weser-Flugzeugbau, Bremen.
1965 - 1983	Chief of the Experimental Aerodynamics Department at VFW (formed by a merger of Weserflugzeugbau and Focke-Wulf, Bremen. Due to additional mergers the name changed to VFW-Fokker, and finally MBB Bremen). Today the companies name is Daimler Benz DASA Airbus
1968 - 1970	Design and Construction of the VFW Low Speed Wind Tunnel
1970 - 1972	Design of the „GUK“ (German project of a large industrial Low Speed Wind Tunnel, finally resulting in the design of the DNW)
1971 - 1973	Member of the AGARD „Large Wind Tunnels Working Group“ (LaW's)
1972 - 1990	Member of several Advisory Groups of the German Ministry for Research and Technology for the Development of the Large Wind Tunnels DNW and ETW.

- 1974 - 1983 Chief Manager of Airbus Wind Tunnel Programme in Germany.  
 1983 - 1998 Professor for Aerodynamics and Measuring Technique at the Darmstadt University of Technology.

**Main Research Fields :** *Theoretical Aerodynamics, Navier-Stokes-Methods*  
*Wind Tunnel Design Technology, Wind Tunnel Testing Technology*  
*Wind Tunnel Balance Design and Fabrication*  
*Balance Calibration Theory and Calibration Equipment*

- 1983 - pres. Consultant of Daimler Benz Aerospace Airbus in the field of Experimental Aerodynamics  
 1991 - 1997 Member of the Fluid Dynamics Panel of AGARD. Editor of AGARDograph 336 „Wind Tunnel Wall Corrections“. Member of several Programme Committees.  
 Member of DGLR and AIAA

### **Dr. J. E. Hackett ("Jim")**

#### **Education :**

5-year apprenticeship with DeHavilland Aircraft Co., working on the Comet, concurrently with first degree studies. 3 years at Imperial College, London leading to Ph.D. and D-I-C. 4 years at The National Physical Laboratory, Teddington, England.

#### **Career :**

Since joining Lockheed in 1967, Dr. Hackett has developed and implemented new technology for the Lockheed Low Speed Wind Tunnel. He is the co-inventor of the wall pressure signature correction method, now widely used. His early work included theoretical modelling of powered whole-aircraft configurations with jet-lift, jet-flap or upper-surface blowing installed. This was complemented by experimental work on the jet flap and direct lift including development of tunnel floor boundary layer control for VISTOL and car tests. Dr Hackett received a NASA Certificate of Recognition for his work on eliminating tunnel flow breakdown.

Basic studies of vortex flows included application to the vortex hazard problem and flight simulator work. His research on three dimensional flow measurement includes new analysis methods and improved drag integration. Dr. Hackett holds a patent on a Vortex Diffuser Device for aircraft drag reduction, that has been flight tested successfully.

Dr. Hackett is author of more than two dozen papers and three dozen reports. His contributions to books include "Aerodynamic Testing of Road Vehicles" SAE SP 1 1 76, 1996; "Low Speed Wind Tunnel Testing" by Rae and Pope; "Aerodynamic Drag Mechanisms of Blunt Bodies and Road Vehicles" and "Aircraft Wake Turbulence and its Detection." Collaborative projects have included work with Carleton University, Georgia Tech, the University of Maryland, Texas A & M, Texas Tech., the University of Washington and the University of Western Ontario. Dr. Hackett is a long-time member of the AIAA and SAE and is active in SAE automobile aerodynamics committees. He is currently a Staff Specialist at the Lockheed Martin Low Speed Wind Tunnel in Georgia. His assignments comprise CFDFD testing/correlation for the Ford Motor Company, which includes collaboration with the University of Maryland, and research on wind tunnel test techniques and tunnel interference for Lockheed Martin.

### **Dr. Hartmut Holst**

#### **Education:**

- 1965 - 1972 : Study of Aerodynamics and Aerospace at University Carolo-Wilhelmina at Braunschweig, Germany  
 1975 - 1976 : Diploma Course at the Von-Karman-Institute for Fluid Dynamics in Brussels, Belgium  
 1990 PhD at the University of Clausthal, Germany

#### **Career:**

1973 - Present : Research Scientist at the DLR (German Aerospace Research Center), Wind Tunnel Department, and since 1994 at the DLR Institute for Fluid Dynamics at Goettingen.

**Research fields:**

1973 - 1974 : aeroacoustics

1975 - 1976 : wind tunnel wall interference

1976 - 1985 : low speed aerodynamics, wind tunnel corrections

1986 - 1990 : two-dimensional wall adaptation for 3D flows

1991 - 1994 : transonic flows, wall interference and wall adaptation, modernisation of transonic facility TWG of DLR Goettingen

1994 - Present: wall adaptation, residual wall interferences, productivity, ventilated walls, wall corrections

**Additional information:**

..... Project support for DNW

..... Involved in modernisation of transonic facility TWG of DLR Goettingen

..... Developing methods for wall adaptation and determination of residuals using measured wall pressures

..... Developing methods for slotted walls (two-step-method)

..... Member of GARTEur group AD AG18 on "Adaptive Wall Wind Tunnels"

## **Alexander J. Krynytzky**

**Education :**

SB (1971) and SM (1972) from the School of Engineering, Department of Aeronautics and Astronautics, at the Massachusetts Institute of Technology. Two years of additional post-graduate study in aerodynamics at MIT.

**Career :**

Since 1977 Mr. Krynytzky has worked for the Commercial Aeroplane Group of The Boeing Company in Seattle, Washington, in a variety of assignments in Aerodynamics Technology. Prior to this employment he served two years in the U. S. Army in rotary-wing flight testing at Edwards Air Force Base, California, and as a teaching assistant in graduate school at MIT.

Mr. Krynytzky's work at Boeing has focused on wind tunnel testing techniques, calibration, corrections, and design. He has been involved in numerous wind tunnel configuration studies using both experimental and computational techniques. Notable among these are the Acoustic Test Section for the Boeing Transonic Wind Tunnel, the Low-Speed Aero-Acoustic Facility, the Boeing New Wind Tunnel Complex (design study), and the National Wind Tunnel Complex (industry-government design activity). Mr. Krynytzky has played a key role in joint development activities between the CFD and aerodynamics laboratories that have resulted in increasingly sophisticated applications of panel methods for the evaluation of wall interference in tunnels used by Boeing, especially for ventilated walls.

Interspersed with assignments in the Testing Research and Development Group at the Aerodynamics Laboratories and in the technology development group of Aerodynamics Research, Mr. Krynytzky's career has also included the 737-300 aeroplane, Mod-5 Wind Turbine, and hybrid laminar flow technology.

## **Dr. Norman D. Malmuth**

### **Education:**

BAE, Aeronautical Engineering, University of Cincinnati, 1953

MAE, Aeronautical Engineering, Polytechnic Institute of New York, 1956

Ph.D., Aeronautics, California Institute of Technology, 1962

### **Career :**

1971 - 1972 Lecturer, UCLA

1982 - Present Project Manager - Fluid Dynamics and Senior Scientist, Rockwell International Science Center

1986 - 1989 Consultant - Aerojet General

1980 - 1982 Manager - Fluid Dynamics Group, Rockwell International Science Center

1975 - 1980 Project Manager - Fluid Dynamics Research, Rockwell International Science Center

1968 - 1975 Mathematical Sciences Group, Rockwell International Science Center

1956 - 1968 North American Aviation Division, Los Angeles Division: Preliminary Design Engineer

1961 California Institute of Technology, Teaching Assistant

1953 - 1956 Grumman Aircraft Engineering Corporation, Research Engineer

Dr. Malmuth has been with the Rockwell International Science Center over 30 years; and was with Rockwell International, Los Angeles Division, 12 years. His current activities include basic research in fluid mechanics with emphasis on hypersonic and transonic flow, nonlinear heat transfer and computational fluid dynamics. Dr. Malmuth, who is a specialist in the application of combined asymptotic and numerical (CAN) methods, has applied these tools to Shuttle multibody interference analyses, drag optimisation at transonic speeds, wind tunnel wall interference, hypersonic boundary layer stability and transition with application to the NASP and other hypervelocity vehicles. His hypersonic flow theories and solutions for optimum hypervelocity vehicles are well-documented in the open literature. Another current thrust of his effort is applying his CAN procedures to the development of rapid conceptual design, plasma aeromechanics, store separation methods and flow control. Dr. Malmuth received the Distinguished Alumnus Award at the University of Cincinnati in 1990 and the AIAA Aerodynamics Award in 1991. He is past Chair of the Rockwell Fluid Dynamics Technical Panel, a member of the NASA Numerical Aerodynamic Simulator Committee, AIAA Applied Aerodynamics and Fluid Dynamics Technical Committees, the Society of Industrial and Applied Mathematics, American Physical Society, and is listed in *Who's Who in the World*.. He has been a U.S. delegate to AGARD, a Fellow of the AIAA and a Visiting Scientist to Rensselaer Polytechnic Institute. Dr. Malmuth has 80 publications and one patent..

## **Dr. Miroslav Mokry**

### **Education :**

Dipl.-Eng. in Mechanical Engineering from the Technical University of Prague (1960) and Ph.D. from the Czech Academy of Sciences (1967).

### **Career :**

Until 1968 Research Scientist at the Institute for Thermomechanics of the Czech Academy of Sciences, specialising in optical methods of flow measurement in wind tunnels. Since 1969 Research Officer at the Aerodynamics Laboratory of the Institute for Aerospace Research (formerly National Aeronautical Establishment) in Ottawa, Canada. Has been involved in wind tunnel wall interference, CFD and, more recently, vortex dynamics. Sessional lecturer at Carleton University. Co-author of AGARDograph 281, "Two-Dimensional Wind Tunnel Wall Interference", and AGARD-AR-269, " Adaptive Wind Tunnel Walls: Technology & Applications". Professional Engineer of the Province of Ontario, Senior Member of the AIAA, and Member of the CFD Society of Canada.

## **Dr. Perry A. Newman**

### **Education :**

Dr. Newman received BS (1958), MS (1960), and Ph.D. (1970) degrees in Physics from Virginia Polytechnic Institute.

### **Career :**

Dr. Newman has been employed at NASA Langley Research Center since May 1962. His primary research interests since then have been in the calculation of high temperature thermodynamic and transport properties, the computational aspects of transonic flows (CFD), development of non-linear wind-tunnel wall interference assessment and correction (WIAC) procedures, and multidisciplinary analysis and optimisation utilising advanced CFD codes. He has authored or co-authored over 90 technical publications in these research areas. He is presently a Senior Research Scientist in the Multidisciplinary Optimisation Branch of the Research and Technology Group.

## **William L. Sickles**

### **Education :**

Bachelor of Science degree in engineering from the University of Virginia in 1972

Master of Science degree in applied mathematics from the University of Tennessee in 1973

### **Career :**

Bill Sickles is a senior research engineer employed with Sverdrup Technology, Inc., an operating contractor at Arnold Engineering Development Center. For more than a decade he has been involved in computational fluid dynamic development and applications. He has also been involved in investigating and correcting factors that effect wind-tunnel data quality such as wall interference, Reynolds-number scaling effects, tunnel-flow humidity, and tunnel-flow quality. He has authored several papers in these areas. He resides in Tullahoma, Tennessee with his wife, Deirdre, and son, Billy.

## **Dr. Frank William Steinle, Jr.**

### **Education :**

B.S., 1961, Aeronautical Engineering, A&M College of Texas

M.S., 1969, Aeronautics & Astronautics - Gasdynamics, Stanford

University D.E., 1984, Aeronautics & Astronautics, 1984, Texas A&M University

### **Career :**

Officer, USAF, assigned to NASA Ames Research Center, 1962 -1965, as a wind tunnel test engineer. Became a civil servant with NASA in 1965, progressing as Group Leader, Research & Analysis, and then as Assistant Branch Chief of Experimental Investigations Branch in 1983, Project Manager responsible for design of Fluid Mechanics Laboratory. Became Assistant Chief, Aerodynamic Facilities Branch of the Aerodynamics Division in 1984 and Chief of the Branch in 1985, responsible for Ames Unitary, 12-Foot, 14-Foot, 2-Foot, and 6-Foot Wind Tunnels, and Fluid Mechanics, Propulsion Simulation, & Balance Calibration Laboratories. Led project teams for definition of requirements for restoration of the Unitary and 12-Foot Wind Tunnel projects and development of new open-architecture data system for Aerodynamics Division wind tunnels. Retired from NASA in 1994 and relocated to AEDC, Arnold AFB, TN as Executive Engineer for Calspan & Microcraft Technology working as technical consultant to the National Wind Tunnel Complex project. Currently employed by Sverdrup Technology, AEDC, as Senior Engineer Specialist responsible for organising, advocating, planning, and managing advanced wind tunnel facilities and wind tunnel testing technology development projects and by the University of Tennessee as Adjunct Associate Professor teaching in the Engineering Management Department.

Associate Fellow in the AIAA and serves on the Ground Testing Technical Committee. Over 40 publications as either author, or co-author in disciplines of wind tunnel correlation, wind tunnel flow quality, & tunnel wall interference,

## **Cyril Richard Taylor**

### **Education :**

BSo (Hons), Sp. Maths. University of London 1955

### **Career :**

1973-1986 Head of High-Speed Aerodynamics Division and Deputy Chief Superintendent.  
Royal Aircraft Establishment, Bedford.

Duties: Manager of

- a) 13 x 9 ft atmospheric, low-speed tunnel
- b) 8 x 8 ft subsonic-supersonic tunnel  
( $M=0.15 - 0.87$  and  $1.35 - 2.5$ , 66 MW, 4 bar.)
- c) 3 x 4 ft high-supersonic-speed tunnel ( $M=2.5 - 5.0$ ., 66MW, 12 bar.)

Manager for research on aircraft and weapon intakes, wing aerodynamics and for tunnel development.

Technical Advisor on ETW,

Chairman of research advisory groups on powerplant installation aerodynamics and signature reduction.

Chairman of international group on aircraft manoeuvring aerodynamics.

## **Nigel John Taylor**

### **Education :**

B.Sc. (Hons), Aeronautics & Astronautics, University of Southampton, 1987.

Dipl. Eng., University of Southampton, 1987.

Ph.D., Applied Aerodynamics, University of Southampton, 1995.

### **Career :**

1987-1993: University of Southampton, Research Student/Assistant.

1993-date: DERA, Senior Scientist.

Principal research interests lie in the fields of high-lift / manoeuvre aerodynamics and wind tunnel technique development. Has produced technical publications on subjects including parachute design, store carriage on helicopters, wake vortex modelling, high-lift device design and adaptive wall technology.

### **Additional information:**

Member AIAA, 1990.

Member RAeS, 1997.

C. Eng., 1997.



## Ralph Voß, PhD

### Education :

University Study (Physics) at Hamburg University (1969-1975)

Research Scientist at the Shipbuilding Institute of Hamburg University (1976-1978)

PhD at Göttingen University (1988)

### Career :

Since 1979 research Scientist at DLR (German Aerospace Research Center) Institute of Aeroelasticity at Göttingen. Since 1990 Head of „Unsteady Aerodynamics Division“

#### Research Fields :

Unsteady transonic flow and transonic flutter

Numerical Methods (CFD, Boundary layer coupling, panel methods)

Validation of CFD codes, wind tunnel wall effects

Adaptive wing technology

Elastic flexible aircraft

## Dr. Erich Hans Wedemeyer

### Education:

1949-1956 Study of Physics at Universities Münster and Göttingen.

1956 Diplom Physicist, University Göttingen.

1969 D. Natural Scis., University Göttingen.

### Career:

1956-1961 Research Physicist, Aerodyn. Versuchsanstalt, Göttingen. Research on hydrodynamic stability, wind tunnel techniques. Publications in ZfW, Ing. Archiv.

1962-1966 US Army Ballistic Research Laboratory, Maryland, USA. Development of the theory of confined fluid motion, research on superheated liquids, plasma flows. Publications in Phys. Fluids, J.Fluid Mech., ZfW.

1966-1980 Head of Gasdynamics Department, DLR Göttingen. Research on hydrodynamic stability, vortex flows, adaptive wall wind tunnel techniques. Articles in J.Aircraft, AIAA Journal, Co-Author (with B.G.Karpov) of Engineering Handbook „Liquid-Filled Projectile Design“.

1981-1982 Visiting Professor at the Von Karman Institute, Brussels. Teaching and research on: high angle of attack aerodynamics, vortex breakdown, on adaptive wall wind tunnel techniques. Development of the theory of two-dimensional wall adaptation for three-dimensional flows.

1982-1990 Senior Scientist, DLR, Göttingen. Research on adaptive wall wind tunnel techniques, hydrodynamic stability, transonic flow computation. Articles in J.Aircraft, AIAA Journal, J.Fluid Mech., ZfW, Co-Author of AGARD-AR-269: Adaptive Wind Tunnel Walls. Three patents on adaptive wall wind tunnels.

1990 Retired from DLR Göttingen.