

**ROBERT D. BANKS, BENG, MD**

**CURRICULUM VITAE**

**EDUCATION**

MD	University of Toronto Toronto, Ontario	1986
BEng (Civil)	Royal Military College Kingston, Ontario	1974
	College Militaire Royale de St. Jean St. Jean, Quebec	1972

**POST GRADUATE STUDIES**

Residency	Aerospace Medicine U.S. Naval Aerospace and Operational Medical Institute Pensacola, Florida	1993
Internship	York-Finch General Hospital Toronto, Ontario, Canada	1987

**SHORT COURSES (SELECTED)**

Traffic Accident Reconstruction	January 1998
Advanced Crash Survival Investigators Course	September 1992
Aerospace Pathology and Accident Investigation	October 1991

**PROFESSIONAL EXPERIENCE**

Consultant/Principal Consultant Biodynamic Research Corporation San Antonio, Texas	1997-Pres
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Head, Aerospace Life Support Defence and Civil Institute of Environmental Medicine	1995-1997
Thrust Leader, Aerospace Performance/Protection Thrust Chief, Research and Development Branch	1995-1997
Staff Physician MCI Medical Clinics, Inc. Toronto, Ontario, Canada	1994-1997
Deputy Director Human Protective Systems Division Defence and Civil Institute of Environmental Medicine	1994-1995
Head, Central Medical Board Defence and Civil Institute of Environmental Medicine	1993-1994
Staff Physician Moose Jaw Medical Clinic	1990-1991
Base Surgeon Canadian Forces Base Moose Jaw	1989-1991
Associate Medical Staff (Emergency Medicine) Union General Hospital Moose Jaw, Saskatchewan, Canada	1987-1991
Associate Medical Staff (Emergency Medicine) Providence General Hospital Moose Jaw, Saskatchewan, Canada	1987-1991
Military Pilot Canadian Forces (CF)	1974-1991

## **BIOMECHANICAL EXPERIENCE**

Hi-G Impact Sled (DCIEM) - Scientific Authority for impact testing of restraints, seats, air bags, helmets and automotive child restraints	1995-1997
Human Centrifuge (DCIEM) - Directed all research on effects of acceleration on humans	1995-1997
Teacher of Biomechanics/Injury Causation	1994-Pres

Injury Causation - Directed review on all military aircraft accidents and provided consultation regarding impact accidents 1994-1997

### **APPOINTMENTS/QUALIFICATIONS**

Clinical Adjunct Professor, USAF School of Aerospace Medicine 2008-Pres

Voting Member ASTM International Committee F24 2005-2009

Member NASA Spacecraft Crew Survival Integration Investigation Team (STS-107 Columbia crash) 2004-2006

Faculty, AAAM Course: Car Crashes and Occupant Injuries 2004

Chairman, Expert Panel on: Physiology and Safety of Amusement Rides 2003

#### **Reviewer:**

IEEE Transactions on Biomedical Engineering 2008

Journal of Biomechanics 2003

Association for the Advancement of Automotive Medicine 2000

Canadian Aeronautics and Space Institute Journal 1997-1998

Aviation, Space and Environmental Medicine Journal 1996-Pres

Peer reviewer, ASTM Task Force on amusement park acceleration standards 2002

Lecturer 2000-2005  
Public Health Science  
University of Toronto

Consultant, North Atlantic Treaty Organization (NATO) 1997-2000  
Research and Technology Organization, Working Group #27

Lecturer, North Atlantic Treaty Organization (NATO) 1997  
Research and Technology Organization, Lecture Series 208

Advisory Editorial Board, Aviation, Space, and Environmental Medicine Journal 1996-1999

Canadian Coordinating Member, Air Standardization Coordinating Committee (ASCC)	1994-1997
Instructor, Medical Aspects of Aircraft Accident Investigation, United States Navy	1992-1993
Lecturer, School of Aerospace Medicine, Canadian Forces	1989-Pres

## **QUALIFICATIONS**

Private Pilot Federal Aviation Administration	1999-Pres
Fellow Aerospace Medical Association	1997
Military Medicine (CF)	1994
Advanced Aerospace Medicine (CF)	1993
Flight Surgeon United States Navy	1993
Canadian Civil Aviation Medical Examiner	1988-1991
Flight Surgeon Canadian Forces	1987-1997
Commercial Pilot Canadian Ministry of Transport	1977-Pres

## **PROFESSIONAL REGISTRATIONS**

Medical Licensures: Alabama	2000-Pres
Texas	1999-Pres
Saskatchewan, Canada	1987-1992
Ontario, Canada	1986, 1992-Pres

## PROFESSIONAL AFFILIATIONS

Association for the Advancement of Automotive Medicine  
Society of Automotive Engineers  
International Society of Air Safety Investigators  
Ontario Medical Association  
Canadian Medical Association  
Aerospace Medical Association

## HONORS AND AWARDS

2010 John Paul Stapp Award Aerospace Medical Association For Outstanding Contributions in Biomechanics	2010
USAF School of Aerospace Medicine Academic Instructor of the Year	2009
Field Instructor of the Year	2007
National Aeronautics and Space Administration Group Achievement Award to Spacecraft Crew Survival Integrated Investigation Team for outstanding Completion of the Columbia Crew Survival Investigative Report	2009
Arnold D. Tuttle Award for Most Significant Contribution in Aerospace Medicine (effects of acceleration)	1996
U.S. Navy Nominee – Julian E. Ward Memorial Award	1993
Top of the Class – U.S. Navy Residency of Aerospace Medicine	1993
Golden Apple Award for outstanding Student Flight Surgeon instructor – U.S. Navy (impact acceleration)	1992 & 1993
U.S. Navy Decorations: Meritorious Unit Commendation	1993
Marksmanship Award	1991
Canadian Decoration with clasp	1991
Director’s Commendation – Junior Staff School	1980

## **PUBLICATIONS**

### **Book/Book Section/Contract Report:**

Barratt, M.; Banks, R.; Stepaniak, P.C.; Lane, H.W. Aerospace Medical Forensic Analysis. In: Stepaniak, P.C.; Lane, H.W., eds. Loss of Signal, NASA: 2014, 96-113.

Banks, R.D.; Brinkley, J.; Allnut, R.A.; Harding, R.M. Human Response to Acceleration. In: Davis, J.R.; Stepanek, J.; Johnson, R.; Fogarty, J.A., eds. Fundamentals of Aerospace Medicine Fourth Edition, Lippincott Williams & Wilkins: 2008, 83-109.

Banks, R.D.; Harding, R.M.; Smith, H.L. Injury Analysis of the Crew Members of STS-107 Space Shuttle Columbia. BRC, San Antonio, TX, NASA Contract (USRA Subaward #9930-275), 28 Jul 2006. (Closed publication)

Banks, R.D.; Harding, R.; Smith, H. Assessing injury potential in rear-end automotive vehicle collisions. In: Yoganendan, N; Pintar, FA, eds. Frontiers in Whiplash Trauma: Clinical and Biomechanical. IOS Press, The Netherlands: 2000, 25-40.

Banks, R.D., ed.; From Whitecaps to Contrails: A History of Modern Air Formation. CFB Shearwater, 1981.

### **Peer Reviewed Papers/Proceedings:**

Lyons, T.J.; Banks, R.D.; Firth, J., Introduction. In: Human Consequences of Agile Aircraft Conference Proceedings. Research and Technology Organization; North Atlantic Treaty Organization. 2000; RTO-EN-12:I-1 to I-8; also, CD Rom format May 2001 (ISBN 92-837-1065-7).

Banks, R.; Harding, R.; Hatsell, C. Letters to the Editor: Roll vs. Pitch Rotation Under Orthostatic Stress. Aviat Space Environ Med September 2000; Vol 71, No 9, Section 1, 966-968.

Banks, R.; Martini, J.; Smith, H.; Bowles, A.; McNish, T.; Howard, R. Alignment of the Lumbar Vertebrae in a Driving Posture. J. Crash Prevention and Injury Control, August 2000, Vol. 2(2), pp. 123-130.

Welsch, H.; Albery, W.; Banks, R.D.; Bles, W., Physiological Consequences: Cardiopulmonary, Vestibular, and Sensory Aspects. In: Human Consequences of Agile Aircraft Conference Proceedings. Research and Technology Organization; North Atlantic Treaty Organization. 2000; RTO-EN-12:4-1 to 4-8.

Goodman, L.S.; Banks, R.D.; Grisset, J. D.; Saunders, P.L. Heart rate and blood pressure responses to +Gz following varied-duration -Gz. *Aviat. Space Environ Med* 2000; 71:137-41.

Banks, R.D.; Hendy, K.C.; Fraser, W.D.; Thompson, M.M.; Jamieson, D.; Wright, H.; Gee, T.; Mack, I.M.; Latulippe, J.; Davis, B.; Cole, M., Defence and Civil Institute of Environmental Medicine and Air Transport Group. Human Factors Study of CC-130 Operations. DCIEM Report #96-R-66, Dec 1996.

Banks, R.D.; Goodman, L.S., Neurological Influence in Push-Pull Effect. Advisory Group for Aerospace Research and Development Conference Proceedings. 1996; 579:1-1 to 1-10.

Banks, R.D., A New Understanding of the Effects of +G. *Canadian Aeronautics and Space Institute Journal*. 1996; 42(3):143-5.

Wright, H.; Banks, R.D., A Method for Investigating Human Factor Aspects of Canadian Forces Air Accidents. *Canadian Aeronautics and Space Institute Journal*. 1996; 42(3):136-8.

Banks, R.D.; Bruce, J., Three Cases of Rabies in the Arctic. Letter to the Editor. *Aviat. Space Environ. Med*. 1996; 67:1106.

Banks, R.D.; Grisset J.D.; Saunders, P.L.; Mateczun, A.J., The Effects of Varying Time Exposure to -Gz on Subsequent Decreased +Gz Physiological Tolerance (push-pull effect). *Aviat. Space Environ. Med*. 1995; 66:723-7.

Banks, R.D.; Gray, G. "Bunt Bradycardia": Two Cases of Slowing of the Heart Rate Under Negative Gz. *Aviat. Space Environ. Med*. 1994; 65:330-1.

Banks, R.D.; Grisset J.D.; Turnipseed, G.T.; Saunders, P.L.; Rupert, A.H., The "Push-Pull Effect". *Aviat. Space Environ. Med*. 1994; 65:699-704.

Banks, R.D., Salisbury, D.A., Ceresia, P.J. The Canadian Forces Airsickness Rehabilitation Program, 1981-1991. *Aviat. Space Environ. Med*. 1992; 63:1098-101.

## Articles/Reports:

Banks, R.D., Book Review: Human Performance and Limitations in Aviation. *Aviat. Space Environ. Med.* 2003; 74:189.

Banks, R.D., Book Review: Muscle Pain: Understanding its Nature, Diagnosis, and Treatment. *Aviat. Space Environ. Med.* 2001; 72:955.  
van Poppel, J.A., Pancratz, D.J., Rangel, M.H., Barton, B.J., Banks, R.D., Bomar, J.B. Model Validation and Design for the Dynamic Environment Simulator. Final Report to Dept. of Air Force, Sept. 98.

Banks, R.D., Book Review: The Cream of the Crop: Canadian Aircrew 1939-1945. *Aviat. Space Environ. Med.* 1998; 69:421.

Banks, R.D., Application of Physical Analysis and Crash Survivability. NATO AGARD Lecture Series 208 Proceedings in Injury Prevention in Aircraft Crashes, Investigative Techniques and Applications. 1998; AGARD-LS-208.

Banks, R.D., Something New In +G Tolerance: Push-Pull Effect. *Flight Comment.* 1995; 5:6-7 (reprinted by French and Australian Air Forces).

Banks, R.D., Crash Force Analysis - A Graphical Approach. *Society of U.S. Naval Flight Surgeons Newsletter*, Vol XVI, No. 1:7-8.

Banks, R.D., Sunburn and G-LOC. *Society of U.S. Naval Flight Surgeons Newsletter*, Vol XI, No. 3:6-7.

Banks, R.D., Aviation Medicine and the General Duty Medical Officer. *MEDICUS*, Spring 1993: 4-7.

Banks, R.D., Contingency Support to the Space Shuttle. *MEDICUS*, Ed. 7; 1993:10-11.

Banks, R.D., Treatment of Airsickness in Student Private Pilots. *CASI:LOG.* 1993;1(2):21-2.

Banks, R.D., The "Push-Pull Effect." *Society of U.S. Naval Flight Surgeons Newsletter*, Vol XVII, No. 3:5-6.

Banks, R.D., The Role of the Pilot - Flight Surgeon in Operational Support. *MEDICUS*, 1989; 1:11-14.

Banks, R.D., Smoking and Seeing at Night. *Flight Comment*, 1984;6:7.



## SCIENTIFIC PRESENTATIONS

Banks, R.D.; Watson, R.A. Analysis of Complex Crash Events in Air and Space, FAA CAMI Injury Workshop, Oklahoma City, OK, November 3-5, 2015.

Banks, R. The Effects of G including the Cardiovascular/Pulmonary Effects of Space Flight. 85<sup>th</sup> Annual Meeting of the Aerospace Medical Association, San Diego, California, 2014 (read by Wright, H).

Banks, R.D.; McCarthy, G. Gz-Tolerance in the Young and Old. 74<sup>th</sup> Annual Meeting of the Aerospace Medical Association, San Antonio, Texas, 2003.

Banks, R.D. G and Aerobatic Flight. First Annual Patty H. Robertson Aerobatic Symposium. The University of Texas Medical Branch, Houston, Texas, April 23, 2002.

Banks, R.D.; Deegear, G.; Lloyd, W. Restraint System Evidence for Accident Reconstruction. SAE Accident Reconstruction, TOPTEC: Special Topics, Tempe, Arizona May 21-23, 2001.

Banks, R.D.; Harding, R.M. Human Interaction with Deploying Air Bags. 71st Annual Meeting of the Aerospace Medical Association, Houston, Texas, 2000.

Banks, R.D. Does Gender or Age Affect Duration of Whiplash Injury in Low Velocity Rear-End Collisions? International Symposium: Whiplash '98, Tempe, Nov. 5-6, 1998.

Banks, R.D.; Wright, H.L.; Buick, F.J., Operational Implications of Push-Pull Effect. 68th Annual Meeting of the Aerospace Medical Association, Chicago, 1997.

Fraser, W.D.; Gee, T.; Banks, R.D., Flight Performance Assessment Using a Knowledge Engineered Scoring System. 68th Annual Meeting of the Aerospace Medical Association, Chicago, 1997.

Banks, R.D.; Wright, H.L.; Buick, F.J., Operational Implications of Push-Pull Effect. 68th Annual Meeting of the Aerospace Medical Association, Chicago, 1997.

Banks, R.D.; Paul, M.A., Death Due To Push-Pull Effect. 67<sup>th</sup> Annual Meeting of the Aerospace Medical Association, Atlanta, 1996.

Goodman, L.; Banks, R.D., Push-Pull Effect: Heart Rate Response Differs from Blood Pressure Response. 67th Annual Meeting of the Aerospace Medical Association, Atlanta, 1996.

McCarthy, G.; Banks, R.D.; Lindner, J.; Adcock, T.; Brown, D.; Demitry, P., Cockpits Good and Bad - An International View. 67th Annual Meeting of the Aerospace Medical Association, Atlanta, 1996.

Banks, R.D., The Operational Significance of Experimental Bias in Centrifuge Acceleration Research. 66th Annual Scientific Meeting of the Aerospace Medical Association, Anaheim, 1995.

Banks, R.D., Gender Difference in +Gz Tolerance Following - Gz (Push-Pull Effect). 66th Annual Scientific Meeting of the Aerospace Medical Association, Anaheim, 1995.

Banks, R.D.; Goodman, L.S., Neurological Influence in Push-Pull Effect. 80th Panel Meeting/Symposium of the AGARD Aerospace Medical Panel, Cologne, Germany, 9 Oct 1995.

Banks, R.D., Acceleration Physiology. Presentation to Medical Aspects of Aircraft Accident Investigation Course, FAA Civil Aeromedical Institute, Oklahoma City, 19 June 1995.

Banks, R.D., The "Push-Pull Effect" - Implications to Flight Testing. Canadian Aeronautics and Space Institute Conference, Winnipeg, 1994.

Banks, R.D.; Grisset, J.D.; Saunders, P.L.; Rupert, A.H., The Effect of the Anti-G Strain and Mueller Maneuvers on -Gz to +Gz Transitions. 65th Annual Scientific Meeting of the Aerospace Medical Association, San Antonio, 1994.

Mateczun, A.J.; Banks, R.D.; Grisset, J.D., -Gz Time Exposure Effects on -Gz to +Gz Transitions. 65th Annual Scientific Meeting of the Aerospace Medical Association, San Antonio, 1994.

Molina, E.A.; Banks, R.D., The Coriolis Acceleration Platform, a Device and Instrumentation for the Study of Negative to Positive Gz Transitions (Push-Pull Effect). 65th Annual Scientific Meeting of the Aerospace Medical Association, San Antonio, 1994.

Banks, R.D., Physiological Effect of -Gz to +Gz Transitions In-Flight. 64th Annual Scientific Meeting of Aerospace Medical Association, Toronto, 1993.

Banks, R.D.; Grisset, J.D., The Push-Pull Effect in G Tolerance. 41st International Congress of Aviation and Space Medicine Hamburg, Germany. 12-16 Sept 93.

Banks, R.D.; Gray, G., In-Flight Holter Monitoring. 63rd Annual Scientific Meeting of the Aerospace Medical Association, Miami, 1992.

Banks, R.D.; Push-Pull Effect: An Unrecognized Flight Hazard? Preprint and Presentation, Naval Aeromedical Problems Course, 18 Nov 92.

Banks, R.D.; Salisbury, D.A.; Ceresia, P.J., The Canadian Forces Airsickness Rehabilitation Program 1980-1990. 62nd Annual Scientific Meeting of the Aerospace Medical Association, Cincinnati, 1991.

Banks, R.D., The Canadian Forces Airsickness Rehabilitation Program. 60th Annual Scientific Meeting of the Aerospace Medical Association, New Orleans, 1989.

### **ADDITIONAL PRESENTATIONS**

Interview and subject matter expert: “@Discover.Ca” on Discovery Channel, 13 May 1997.

Personal profile: “Flightpath: Fighting the Gs” on Discovery Channel, 12 November 1996.

Interview and subject matter expert: “Flightpath” on Discovery Channel, 3 November 1996.

Spokesperson and subject matter expert for “The Push-Pull Effect.” Directorate of Flight Safety (CF) Training Video, February 1996.

Interview concerning Canadian Forces medical support for the Gulf War. Canadian Broadcasting Corporation, Regina. November 1990.