Tony Hays c.v.

Summary

Tony has worked in the aerospace industry for over 50 years, having joined Bristol Siddeley Engines (which later became part of Rolls-Royce) in 1962 as an apprentice. He holds a B.Sc. degree in Aeronautical Engineering from Bristol University in the UK, and an S.M. degree in Aeronautics and Astronautics from MIT. He worked at Lockheed Martin for 30 years, mostly in aircraft conceptual design. Designs he has worked on have varied from a vertical takeoff airliner (Hawker Siddeley 133/141) to a single stage to orbit scramjet-powered spyplane (National AeroSpace Plane). He has also been involved in other areas of aircraft design and operation, including aeroacoustics, flight crew training (Lockheed C-130J), flight manual development (C-130J and Lockheed C-5M), and market development (De Havilland Canada DHC-7). He has taught classes in aircraft design at several universities in the United States and China. More information can be found at www.adac.aero.

Tony Hays

Professor at Aircraft Design and Consulting

Specialties: Advanced design, aerodynamics and performance, propulsion, acoustics, flight crew training.

UK and US citizen

Born in Fulmer (UK), 20-2-1944

Residence Address: 1810, Vista Marea - San Clemente - California - USA

Experience

Aircraft Design and Consulting
June 2007 to now - 15 years, 11 months
San Clemente, California

Visiting Professor
Nanjing University of Aeronautics and Astronautics
Nanjing, Jiangsu, China
Feb 2014 to now

Taught 8-week course "Aircraft Conceptual Design" in March-April 2014 and 2015. Guest lecturer and research associate related to aircraft design and propulsion.

Lecturer in Aircraft Conceptual Design
California State University, Long Beach
Long Beach, CA
August 2011- Dec. 2013 - 2 years, 5 months
Taught MAE 451/551 Aircraft Preliminary Design and Performance in the Fall Semester. This is a combined undergraduate/graduate course in conceptual design (contrary to the title of the course).

Lecturer in Aerospace Systems Design
UC San Diego
La Jolla, CA
March 2008 - June 2009 - 1 year, 4 months
Taught one-half of MAE 155A (the aircraft half of Aerospace Design I) in the Winter Quarter plus MAE 155B (Aerospace Design II) in the Spring Quarter.

Staff Engineer
Lockheed Martin Aeronautics
Burbank, CA and Marietta, GA
June 1976 - May 2006 - 29 years, 10 months
Led noise/cost tradeoff studies for SSTs, and SST flight path optimization with respect to noise, and related studies. Managed design and analysis team in program for far-term L-1011 derivative. Managed NASA study to determine costs/benefits and plans for implementing fuel reducing technologies (aerodynamics, propulsion, systems and materials) in long-range commercial transports. Managed contract with Rolls-Royce to evaluate new engine concepts on short-haul aircraft. Managed NASA contract to determine costs/benefits and plans for implementing a digital flight control system and "all-electric" secondary power systems on commercial aircraft. Worked on performance and sizing programs for National AeroSpace Plane. Chief engineer for High-Speed Civil Transport program. Managed joint project with Korea Commercial Aircraft Development Consortium on design of a 100 passenger aircraft. Worked on crew training and flight manual development for C-130J. Also worked on flight manual for C-5 RERP. Worked on numerous far-term derivatives of C-130, and C-130 replacement.

Lecturer
Northrop University
Inglewood, CA
Aug. 1988 - dec. 1989 1 year, 5 months
Taught Aircraft Conceptual Design AE481/482/483 part time.

Senior Consultant
Bolt Beranek and Newman
Canoga Park, CA

June 1974 - Feb 1976 - 1 year, 9 months
Worked on certification of C-130 to FAR Part 36. Worked on noise survey of engine test cell, and several airport noise surveys. Implemented computer program to calculate aircraft performance for subsequent noise contour calculations. Gained extensive experience in developing noise contours from flight operations.

Aviation Consultant
Aviation Planning Services
Montreal, PQ
Sept 1973 - May 1974 - 9 months
Prepared route applications for Canadian third level carrier for presentation to Canadian Transport Commission. Worked on noise study at Vancouver International Airport, analysis of airline capacities in Africa, and airport development at Kingston, Ontario.

Marketing Engineer
De Havilland Canada
Downsview, ON
gen 1973 - oct 1973 - 10 months
Analyzed short-haul demand to determine markets for the DHC-7, and prepared technical briefs for presentation to government and industry to promote the concept of the quiet STOL system.

Research Assistant/Research Staff
Flight Transportation Lab, MIT
Cambridge, MA
sept 1969 - jan 1973 - 3 years, 5 months
Worked on redesign and modification of the 7ft X 5ft closed jet wind tunnel to an open jet anechoic tunnel. Developed dynamic programming technique to optimize the flight paths of VTOL aircraft with respect to perceived noise. Developed analytical methods for estimating individual and community response to aircraft noise, and methods of alleviation through aircraft design and regulation. Performed market research to determine potential for a 30 - 50 seat aircraft on short-haul, low/medium

Project Engineer, Propulsion Systems
Hawker Siddeley Aircraft
Hatfield, Herts, UK
sept. 1968 - july 1969 - 11 months
Designed and supervised construction and rig testing of model thrust deflectors for fan-lift engines for a VTOL airliner (HS 133/141). Wrote computer program to simulate engine cycle and examine effects of lift-engine bleed (for lateral control) on very high bypass engine performance. Assisted working party on formulation of Air Registration Board requirements for VTOL aircraft.

Graduate Apprentice/Development Tool Engineer

Bristol Siddeley Engines/Rolls-Royce Ltd.
Bristol and Leavesden, Herts, UK
sept. 1962 - august 1968 - 6 years
Trained in basic machine shop practice, and all aspects of aero-engine production; also studied research, development, design and testing of aircraft engines. Tested new tools and investigated problems of manufacturing Olympus 593 for Concorde.

Studies
Massachusetts Institute of Technology
S.M. Aeronautics and Astronautics
1969 - 1972
Other activities :Secretary MIT Chapter of AIAA

Awarded S.M. degree in 1971. Worked on research staff in Flight Transportation Lab until the end of 1972.
University of Bristol
B.Sc.Aeronautical Engineering Upper Second Class Honours
1962 - 1965
Other activities and associations: Royal Aeronautical Society, Institution of Mechanical Engineers

Publications
Aerodynamic design and evaluation of an open-nose supersonic drone
Proceedings of the Institution of Mechanical Engineers, Part G: Journal of Aerospace Engineering 15 april 2022
The objective of this paper is to investigate the efficiency of a proposed supersonic drone configuration, in terms of drag, ram recovery, and fundamental flight performance factors. Sustainable supersonic cruise at Mach 1.6 is the major segment of the mission profile which affects the overall geometry resulting from the conceptual design phase, a tailless delta drone with an open-nose forebody, lofted around the inlet which consists of an analytical compression surface and a S-duct
Other Authors:
Eiman B. Saheby, Shen Xing

Flow Structure of the Ridge Integrated Submerged Inlet
Elsevier Science Direct: Aerospace Science and Technology 27 sept. 2021
For Abstract, click on "Show Publication"
Other Authors:
Eiman B. Saheby, Shen Xing (沈星), Huang Guoping (黄国平)

The inlet flow structure of a conceptual open-nose supersonic drone
Journal of Aerospace Engineering/Institution of Mechanical Engineers 1 march 2021
Other Authors:
Eiman B. Saheby, Shen Xing (沈星),Zhang Julin

Design and Performance Study of a Parametric Diverterless Supersonic Inlet
Proceedings of the Institution of Mechanical Engineers, Part G: Journal of Aerospace Engineering 24 sept. 2019
Other Authors:
Eiman B. Saheby, Shen Xing (沈星)

Initial Aircraft Sizing - A Critique
Asian Workshop on Aircraft Design Education AWADE 2018 16 Oct. 2018
Review of textbook procedures for initial aircraft sizing (i.e., determining the takeoff gross weight to perform a specified design mission), with recommendations for preferred method.

Aircraft Design for Reduced Carbon Emissions
Asian Workshop on Aircraft Design Education AWADE 2018 15 Oct. 2018
For students, the conceptual design of an aircraft for reduced carbon emissions provides both opportunities for innovation, and challenges in estimating basic design parameters, especially empty weight, but also drag and power requirements. This paper examines propulsion options and possible design synergies.
International Journal of Aerospace Engineering/Hindawi 19 August 2018

Design of Top Mounted Supersonic Inlets for a Cylindrical Fuselage
Journal of Aerospace Engineering/Institution of Mechanical Engineers July 2018
Designing an inlet based on the fuselage geometry and its constraints is an important part of flight vehicle design. Among the different possible configurations, design integration of a supersonic inlet with a cylindrical fuselage is a major challenge. On one hand, propulsive efficiency requirements force the designers to consider the simplest compression surfaces for the inlet entrance geometries and on the other hand, the considerable drag of inlet/diverter integrations needs to be minimized,
Other Authors:
Eiman B. Saheby,Huang Guoping

Generation of the Drag Map and Derivative Plots for Commercial Aircraft
Asian/European Workshop on Aircraft Design Education, Nanjing University of Aeronautics and Astronautics 19 Oct. 2017
The drag map provides important information about the transonic aerodynamic characteristics of an aircraft design. In an aircraft design course, students should be aware of the significance of the drag map and its derivative plots. This paper describes how a drag map and its derivatives can be constructed that are representative of a given configuration.

Future Trends in Aircraft Design
Asian/European Workshop on Aircraft Design Education, Nanjing University of Aeronautics and Astronautics 18 Oct. 2017
This paper provides an overview of future trends in aircraft design with a concentration on fixed-wing transport aircraft. Examples include ideas that are not

necessarily new, but have resurfaced, and may yet submerge again, and designs that are new but do not require new technology, plus a few designs that are reliant on evolving technology. The paper concentrates on designs themselves, rather than supporting technologies, such as propulsion, structures, stability and control, or aircraft.

Design of Hypersonic Forebody by the Combination of Bump and Waverider Surfaces
21st International Space Plane and Hypersonic Systems and Technology Conference, Xiamen, China, AIAA-2017-2177 7 March 2017
CFD analysis of a combination of a concave waverider surface operating at Mach 5.0 which contains a bump at the engine inlet. The bump surface effectively diverts the boundary layer to the sides of the inlet, resulting in pressure recovery of 0.53 at the inlet. Detailed flow visualization, including simulated oil flow patterns, is provided. For the record - the correct list of authors is Saheby, Huang, Hays.
Other Authors:
Eiman B. Saheby, Huang Guoping（黄国平）

Teaching Aircraft Conceptual Design at the Undergraduate and Graduate Levels
Nanjing University of Aeronautics and Astronautics, Asian Workshop on Aircraft Design Education 11 Oct. 2016
Summary of syllabus for teaching aircraft conceptual design, highlighting areas of difficulty for students, and methods of improvement in explanation using an eclectic mixture of procedures from various textbooks.

Design of Wave Derived Inlet for High Curvature Fuselage
AIAA 2016-4607 52nd AIAA/SAE/ASEE Joint Propulsion Conference, 25 July 2016
Design and analysis of two inlets designed for Mach 1.6, for which the inboard lip is curved and can thus be integrated on a curved fuselage with a minimized boundary layer diverter cross-sectional area.
Other Authors:
Eiman B. Saheby, Huang Guoping （黄国平）

Fixed Wing Vehicle Mobility-Bomber-Patrol Systems Study
Air Force Research Laboratory Report AFRL-VA-WP-TR-1999-3026 march 1999
Other Authors:
Brian Gage, et al.

The Future of Very Large Subsonic Transports
NASA Report, Transportation Beyond 2000: Technologies Needed for Engineering Design feb. 1996
Other Authors:
Steve Justice, Ed Parrott

Zen and the Art of Airplane Sizing

SAE Paper 931255 may 1993
A somewhat simplistic approach to the process of sizing an aircraft to meet a given mission requirement using an HP-25 calculator. Also published in the AIAA Student Journal.

This is an Emergency - Is there an Aero Engineer on the Plane?
AIAA Student Journal june 1992
A description of an incident in which a Boeing 747SP on a flight from Hong Kong to Seattle had to declare an emergency because of a mechanical malfunction. The author, who was a passenger on the flight, was summoned to the flight deck by the captain and asked for his opinion.

Spreadsheet Methods for Aircraft Design
AIAA Paper AIAA-89-2059 august 1989
First published description of the use of spreadsheets (in this case Lotus 1-2-3) in the aircraft conceptual design process. Spreadsheet tools on Excel (such as Goalseek or Solver) were not available, but the basic principles described here are still valid.

What Went Wrong? Why Some Commercial Aircraft Programs Didn't Live Up To Expectations
Airshow Canada Symposium, Vancouver, Canada, august 1989
An analysis of why some commercial aircraft programs did not achieve the success that was expected. These programs were: DH Comet, Lockheed Electra, Convair 880/990, DH Trident, Vickers VC10, BAC/Sud Aviation Concorde, Lockheed L-1011, Dassault,Mercure, VFW-Fokker 614 and Boeing 2707 (which did not make it to production, but got pretty close).

Getting a Job: Some Advice from a College Recruiter
AIAA Student Journal Winter 1989, jan, 1989
Republished by Chronicle Guidance Publications, October 1989. Some advice to students who are about to graduate with an engineering degree on how to approach a job interview.

Integrated Digital/Electric Aircraft Concepts Study
NASA CR-3841 feb. 1985
The integrated digital/electrical aircraft (IDEA) is an aircraft concept which employs all electric secondary power systems and advanced digital flight control systems. After trade analysis, preferred systems were applied to the baseline configuration. An additional configuration, the alternate IDEA, was also considered. For this concept the design ground rules were relaxed in order to quantify additional synergistic benefits. It was proposed that an IDEA configuration and technical risks.
Other Authors:
M.J. Cronin, F.B. Green, N.A. Radovcich, C.W. Helsley, W.L. Rudchik

Advanced Turboprop and Dual Cycle Engine Performance Benefits and Installation Options on a Mach 0.7 Short-Haul Transport Aircraft

AIAA Paper AIAA-83-1212 june 1983
Evaluation of novel engine cycles compared with an advanced turboprop cycle on a Mach 0.7 short-haul transport aircraft.
Other Authors:
H. W. Bennett, G.L. Herstine

Integrated Technology Wing Design Study
NASA CR-3586 aug. 1982
Evaluation of the costs and benefits of the application of advanced technology (aerodynamics, structures and materials, stability and control, all-electric systems, and propulsion) on the design of a 350 passenger, 4600 nm commercial transport aircraft.
Other Authors:
W. E. Beck, W.H. Morita, B.J. Penrose, Wainfan X.

Fuel Efficient Commercial Transport Design
AIAA Paper AIAA-81-1682 feb. 1982
Application of advanced technologies on the design of a 150 passenger airliner.
Other Authors:
Bruckman G.

Optimization of SST Flight Paths with Respect to FAR Part 36 Noise using Dynamic Programming
Proceedings - Noise Control for the 80's - Volume II, (pp. 851- 854) Noise Control Foundation dec. 1980

Optimization of SST flight paths with respect to FAR Part 36 noise using dynamic programming.
Supersonic Cruise Vehicle Technology Assessment Study of an Over/Under Engine Concept
NASA CR-159247 1980
This report describes the work completed by Lockheed during the FY 1979 NASA LaRC Supersonic Cruise Vehicle Technology Assessment studies. Analytical planform studies were conducted to examine the variation in supersonic cruise lift/drag ratio, weight, and mission range due to arrow wing planform changes, such as sweep, aspect ratio, and notch ratio. Airframe/propulsion integration studies included inlet technology and low speed aerodynamic/acoustic tasks for supersonic inlets. Preferred…
Other Authors:
J.S Clauss, F.A Bruckman, L.H. Bangert, G.E. Carichner, M.K. Guess, L. Jurey, I.F. Sakata

Supersonic Cruise Vehicle Technology Assessment Study of an Over/Under Engine Concept,

NASA CR-159003 dec. 1978
The effects of arrow-wing planform geometry variations on airplane low-speed handling qualities are investigated using piloted flight simulation techniques. Baseline aircraft engine/airframe integration and installation studies increased aircraft range and defined more realistic engine/nacelle designs. Alternative engine candidates were investigated. Advantages of integrated digital control for engines are identified.
Other Authors:
B. R. Wright, J.S. Clauss, B.T. Averett, T.P. Oatway, I.F. Sakata C.

The Common Case Study: Lockheed Design of a Supersonic Cruise Vehicle
NASA CR-158935 august 1978
The objective was to compare the characteristics of SSTs designed for the same mission by Lockheed, McDonnell Douglas, British Aerospace (U.K.), Aerospatiale (France), and the USSR. This comparison was to be used to calibrate parametric design studies of the tradeoff between SST direct operating cost (DOC) and noise levels at the FAR 36 certification points. The guidelines for this common case study were to design an aircraft with the following mission: payload 23 247 kg (51 250 lbm), range.
Other Authors:
J.S. Clauss, J.R. Wilson

Noise/Cost Sensitivity Studies for a Supersonic Cruise Vehicle with an Over/Under Engine Concept
NASA CR-158295 1978
The relationship was studied between predicted noise levels at the FAR Part 36 measurement points and predicted direct operating costs (DOC) for an SST with a specified mission, thereby assessing the feasibility of meeting FAR Part 36 (1969) noise requirements and identifying the associated DOC penalties. Various configuration and operational procedures options were applied to a baseline configuration incorporating late 1980's level technology. These options include thrust-weight ratio and wing

Experimental Investigation of Aerodynamic Noise vs. Drag Relationship for Circular Cylinders
AIAA Paper AIAA-77-1292, 4th Aeroacoustics Conference oct. 1977
Evaluation of the correlation between noise and aerodynamic drag of circular cylinders with respect to the prediction of noise of landing gear components. Also published in AIAA Journal, 1978, Vol 16, pp 889-897.
Other Authors:
J.D. Revell, R.A. Prydz

Developing Noise Exposure Contours for General Aviation Airports
FAA Report FAA-AS-75-1 dec. 1975
This report describes a procedure for generating noise contours around general aviation airports using three units of noise exposure: composite noise rating (CNR),

noise exposure forecast (NEF), and day/night levels (LDN).The procedure is to determine the number of annual operations at an airport, and to apply a weighting to this number to account for such effects as multi-engine and nighttime operations; propeller and jet operations are considered separately. A series of noise contour maps
Other Authors:
D.E. Bishopet

The Short-Haul Revolution
Government and Military Business Vol 1 No 6 aug1974
A description of how short take-off and landing (STOL) aircraft and STOLports can revolutionize intercity transportation.

A Proposed System for Aviation Noise Measurement and Control
MIT Flight Transportation Laboratory Report R73-2 jan. 1973
This report reviews previous work on various measures for aviation noise, and proposes acompletely new system for aviation noise measurement and control compatible with real time, operational noise monitoring hardware.
Other Authors:
Robert W. Simpson

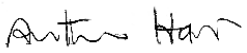
Aircraft requirements for low/medium density markets
MIT Flight Transportation Laboratory Report R73-4 1973
In 1971, the joint Department of Transportation, National Aeronautics and Space Administration, Civil Aviation Research and Development Policy Study (CARD) Report, identified the problems of providing air service to low density, short haul markets, as the third most pressing difficulty facing the United States' aviation industry. In the words of the report, "Low-Density Short Haul: While lower in priority than noise and congestion, solutions to the problems of low-density, short-haul service…Visualizza altro
Other Authors:
R.A. Ausrotas, S.M. Dodge, H.B. Faulkner, I. Glendinning, R.W. Simpson, W.M. Swan, N.K. Taneja, J.F. Vittek

DHC-7 Update
Shell Aviation News, No. 419, 1973 1973
Progress on development of the De Havilland Canada Dash 7, and its future role as a regional and inter-city commuter aircraft, capable of takeoff and landing from a 2000 ft runway. The aircraft offers quiet and convenient transportation between city-centre STOL ports.
The Relationship Between Total Community Annoyance and Noise Intensity
MIT Flight Transportation Lab Memorandum 1973
Other Authors:
Robert W. Simpson

A Systems Study of Noise Requirements on the Design of V/STOL Aircraft

U.S. Army Research Office (Durham) and American Helicopter Society sept. 1971
This report includes results of S.M. thesis on optimization of helicopter flight paths to minimize noise using dynamic programming.
Other Authors:
R. W Simpson, H. Faulkner

Noise Minimization of Helicopter Take-off and Climb-out Flight Paths Using Dynamic Programming
MIT S.M. Thesis 1971
Turbulent Wall Jets on Logarithmic Spiral Surfaces
Royal Aeronautical Society, Aeronautical Quarterly august 1966
Two-dimensional turbulent air jets maintain geometric similarity when flowing over a logarithmic spiral surface (a surface for which the radius of curvature is proportional to the distance along the surface from some arbitrary origin). This suggests that this may be the preferred shape for an upper-surface blown flap.
Other Authors:
Dr. Robert A. Sawyer, Jacques Giles



Prof. Anthony Hays