

ICAS PROCEEDINGS
1980

12th Congress of the International Council of the Aeronautical Sciences



MUNICH · FEDERAL REPUBLIC OF GERMANY · OCTOBER 12-17, 1980

TABLE OF CONTENTS

PREFACE

R.L. BISPLINGHOFF..... X

THE DANIEL AND FLORENCE GUGGENHEIM MEMORIAL LECTURE

ICAS-80-0.1 How to Improve the Performance of Transport Aircraft
by Variation of Wing Aspect-Ratio and Twist
E. TRUCKENBRODT 1

GENERAL LECTURES

ICAS-80-0.2 The Next Generation of Commercial Aircraft -
The Technological Imperative
J.M. SWIHART not available *sep. paper*

ICAS-80-0.3 The Analysis of Fatigue Failures
C.J. PEEL, P.J.E. FORSYTH 18

ICAS-80-0.4 Impact of Advanced Control Concepts on
Aircraft Design
H.A. REDIESS not available *sep. paper*

CIVIL AIRCRAFT CONFIGURATIONS

ICAS-80-1.1 Aerodynamic Concepts for Fuel-Efficient
Transport Aircraft
G. KRENZ, R. HILBIG not available

ICAS-80-1.2 Numerical Optimization: An Assessment of its
Role in Transport Aircraft Aerodynamic Design
through a Case Study
M.E. LORES, P.R. SMITH 41

ICAS-80-1.3 Wing Design for Light Transport Aircraft
with Improved Fuel Economy
D. WELTE, R. BIRRENBACH,
W. HABERLAND not available *sep. paper*

ICAS-80-1.4 The Relevance of the Flex-Hub Prop-Fan for
Fuel-Efficient Airliners
K.W. SAMBELL 53

ICAS-80-1.5 New Concepts for Design of Fully-Optimized
Configurations for Future Supersonic Aircraft
A. NASTASE 63

MILITARY AIRCRAFT CONFIGURATIONS

ICAS-80-2.1 Transonic Fighter Design Using
Numerical Optimization
P.V. AIDALA not available *sep. paper*

ICAS-80-2.2	Possibilities for the Valuation of Different Combat Aircraft Configurations with Respect to Flight Mechanics P. MANGOLD, H. WONNENBERG	75
ICAS-80-2.3	Advanced Combat Aircraft Wing Design B. PROBERT, D.R. HOLT	82
ICAS-80-2.4	Some Experiences with Numerical Optimization in Aircraft Specification and Preliminary Design Studies D.A. LOVELL	97
ICAS-80-2.5	Mini-RPV for Reconnaissance and Target Acquisition/Designation on Battlefield (Concept and Test Results) M. MÖHRING	not available

CAD / FUEL SYSTEM

ICAS-80-3.1	DRAPO: Integral Computer-Assisted Design and Manufacturing System F. BERNARD	112
ICAS-80-3.2	Computer-Aided Compilation of an Electrical Drawing File J.P. PAUZAT	123
ICAS-80-3.3	Advanced Fuel System Technology for Utilizing Broadened Property Aircraft Fuels G.M. RECK	129

PROPULSION AIRFRAME INTEGRATION

ICAS-80-4.1	Calculation of the Flow Field around Engine-Wing-Configurations C. HABERLAND, E. GÖDE, G. SAUER	144
ICAS-80-4.2	Engine Air Intake Design Support by Use of Computational Methods and Comparison of Theoretically Derived Pressure Distributions with Experimental Data A. EBERLE, D.M. SCHMITZ	158
ICAS-80-4.3	A Study of the Air Inlet Efficiency of a Combat Aircraft Concept with Dorsal Inlet K. WIDING	173
ICAS-80-4.4	Experimental Studies of the Upper-Surface- Blowing Propulsion System at Cruise J.A. BRADEN, W.C. SLEEMAN	not available <i>sep. paper</i>
ICAS-80-4.5	On Screeching Jets Exhausting from an Axisymmetric Supersonic Nozzle G.M. CARLOMAGNO, C. IANNIELLO, P. VIGO	183

ACTIVE CONTROLS

ICAS-80-5.1	The All-Electric Aircraft D.K. BIRD	189
-------------	--	-----

ICAS-80-5.2	Flying Qualities Criteria for Advanced Control Technology Transports H.A. MOOIJ	202
ICAS-80-5.3	Improved Flight Control Performance and Failure Tolerance Using Modern Control Techniques H. BERMAN	209
ICAS-80-5.4	OLGA, A Gust Alleviation System for Improvement of Passenger Comfort of General Aviation Aircraft B. KRAG, D. ROHLF H. WÖNNENBERG	219
ICAS-80-5.5	Active Flutter Suppression Design and Test, a Joint U.S. - F.R.G. Program T. NOLL, H. HÖNLINGER, O. SENSBURG, K. SCHMIDT	232
ICAS-80-5.6	A Stability Augmentation System which Covers the Complete Flight Envelope for a F-4C Aircraft without Gain Scheduling G. KREISSELMEIER, R. STEINHAUSER	242

FLIGHT MANAGEMENT SYSTEMS

ICAS-80-6.1	Design of Navigation Estimation Algorithms for Implementation on a Microprocessor V.B. GYLYS, J.N. DAMOULAKIS	not available <i>sep. paper</i>
ICAS-80-6.2	Multivariable Aircraft Control Manoeuvre Commands - An Application to Air-To-Ground Gunnery DANG VU BINH	247
ICAS-80-6.3	Some Aspects of Advanced Flight Management Systems and their Application to Modern Transport Aircraft H. GRIEM	not available <i>sep. paper</i>
ICAS-80-6.4	Maneuver Optimization of Aircraft Utilizing High Angles of Attack K.H. WELL, B. FABER, E. BERGER	257

DYNAMIC STABILITY

ICAS-80-7.1	Dynamic Stability Parameters at High Angles of Attack K.J. ORLIK-RÖCKEMANN, E.S. HANFF	265
ICAS-80-7.2	Investigation of High-Manoeuvrability Flight Vehicle Dynamics M.E. BEYERS	278
ICAS-80-7.3	Longitudinal Motion of Low-Flying Vehicles in Nonlinear Flowfields R. STAUFENBIEL, G. KLEINEIDAM	293
ICAS-80-7.4	Identification of Longitudinal Flying Characteristics of an Aeroplane and the Effect of Nonstationary Aerodynamics V. KOCKA	309
ICAS-80-7.5	A Rapid Method for the Approximate Determination of Nonlinear Solutions: Application to Aerodynamic Flows S.S. STAHARA, J.P. ELLIOTT, J.R. SPREITER	324

FUTURE COCKPITS

ICAS-80-8.1	New Developments in Cockpit Human Interfaces E.B. DAVIES, J.B. PECKHAM	338
ICAS-80-8.2	The Future Cockpit of the Next Generation of Civil Aircraft J.P. LABORIE	347
ICAS-80-8.3	A Theoretical and Practical Design Investigation of the Future Military Cockpit J.W. LYONS	353
ICAS-80-8.4	On the Possibilities of Pilots to Get Information from Outside by Vision H.-E. HOFFMANN	360

SIMULATION

ICAS-80-9.1	Simulation of Tactical Aircraft Weapons Systems: A Methodology for Performing Trade-Off Analyses for Avionics Systems Aircraft Performance and Ordnance Capabilities R.J. SANATOR, C. PROKOP	not available
ICAS-80-9.2	Development and Application of a Moving-Base Visual Flight Simulator Including the Design of Hydraulic Actuators with Hydrostatic Bearings T.J. VIERSMA, M. BAARSPUL	371
ICAS-80-9.3	Reduction of the Take-Off Ground Run Distance to a Given Set of Atmospheric Condition D. IONESCU	385
ICAS-80-9.4	Use of DFVLR In-Flight Simulator HFB 320 Hansa for Handling Qualities Investigations H.-H. LANGE, D. HANKE	not available <i>sep. paper</i>
ICAS-80-9.5	The Role of Flight Simulation in the Design and Development of the Sea Harrier Nav-Attack System H.J. ALLEN, P.R. WALWYN	391

BASIC AERODYNAMICS

ICAS-80-10.1	Low-Speed Airfoil Section Research at Delft University of Technology J.L. VAN INGEN, L.M.M. BOERMANS, J.J.H. BLOM	401
ICAS-80-10.2	Some Practical Aspects of the Burst of Laminar Separation Bubbles N. KAMIYA, S. SUZUKI, M. NAKAMURA, T. YOSHINAGA	417
ICAS-80-10.3	Design and Tests of an Helicopter Rotor Blade with Evolutive Profile J.J. THIBERT, J.M. POURADIER	429
ICAS-80-10.4	Review of Numerical Methods for the Problem of the Supersonic Flow Around Bodies at Angle of Attack P.I. CHUSHKIN	444

TRANSONIC AERODYNAMICS

- ICAS-80-11.1 Research on Transonic Wings at the
National Aerospace Laboratory, Japan
N. KAMIYA, N. HIROSE 455
- ICAS-80-11.2 Adaptive Airfoils and Wings for
Efficient Transonic Flight
H. SOBIECZKY, A.R. SEEBASS not available *sep- paper*
- ICAS-80-11.3 Flow Computation Around Multi-Element Airfoils
in Viscous Transonic Flow
H. ROSCH, K.D. KLEVENHUSEN 470

HIGH-LIFT RESEARCH I

- ICAS-80-12.1 High-Lift Research and its Application
to Aircraft Design
J.R. WEDDERSPOON 480
- ICAS-80-12.2 Recent Advances in Boeing High-Lift
Technology
J.L. LUNDRY 494
- ICAS-80-12.3 High-Lift Investigations on Some Small
Aspect Ratio Wings
H. KÖRNER 501
- ICAS-80-12.4 Optimizing the Fixed Leading Edge Shape
of a Transonic Wing to Suit the Landing
High-Lift Requirements
M. INGELMAN-SUNDBERG, L.-E. ERIKSSON 513
- ICAS-80-12.5 Winglets Development at Israel
Aircraft Industries
I. DAREL, Y. ELIRAZ,
Y. BARNETT 522
- ICAS-80-12.6 Slotted Flapped Wing Sections for
Variable Geometry Sailplanes
D.J. MARSDEN, R.W. TOOGOOD not available

HIGH-LIFT RESEARCH II

- ICAS-80-13.1 Delta-Canard Configuration at
High Angle of Attack
W. KRAUS not available *sep- paper*
- ICAS-80-13.2 Influence of Jet Location on the Efficiency
of Spanwise Blowing
W. STAUDACHER not available *sep- paper*
- ICAS-80-13.3 Optimum Subsonic, High-Angle-of-Attack
Nacelles
R.W. LUIDENS, N.O. STOCKMAN,
J.H. DIETRICH 530
- ICAS-80-13.4 Vortex Drag Reduction by Aft-Mounted
Diffusing Vanes
J.E. HACKETT 542
- ICAS-80-13.5 Leading-Edge 'Vortex Flaps' for Enhanced
Subsonic Aerodynamics of Slender Wings
D.M. RAO 554

VISCOUS PHENOMENA AND THEIR MODELING

- ICAS-80-14.1 An Experimental Investigation of the Interaction Between a Glancing Shock Wave and a Turbulent Boundary Layer
H. KUBOTA, J.L. STOLLERY 563
- ICAS-80-14.2 Numerical Prediction of Vortex Cores from the Leading and Trailing Edges of Delta Wings
O.A. KANDIL not available *sep. paper*

STRUCTURAL OPTIMIZATION

- ICAS-80-15.1 Optimization of Aeronautical Structures via Finite Element Technique
L. BALIS CREMA, R. BARBONI,
A. CASTELLANI not available
- ICAS-80-15.2 Weight Optimization of Wing Structures According to the Gradient Method
D.W. MATHIAS, H. RÖHRLE,
J. ARTMANN 575
- ICAS-80-15.3 Structural Optimization of Advanced Aircraft Structures
G. SCHNEIDER, H. GÜDEL,
O. SENSBURG 583

MATERIALS

- ICAS-80-16.1 Application of Weldbonding to A-10 Production Aircraft
A. SHAMES, R. RUPP,
J. CLARKE 596
- ICAS-80-16.2 Development of the A 300 Fin in Modern Composite Fibre Construction
D. SCHULZ 604

STRUCTURAL TESTING

- ICAS-80-17.1 Contrôle Non Destructif des Pièces en Matériaux Composites
M. TRECA, J. ODORICO 619
- ICAS-80-17.2 Holographic Non-Destructive Testing of Materials Using Pulsed Lasers
H. FAGOT, F. ALBE,
P. SMIGIELSKI, J.L. ARNAUD 626
- ICAS-80-17.3 Structural Flight Load Testing, Calibration and Analysis
E. RAUSCHER 634
- ICAS-80-17.4 Initial Postbuckling Behaviour of Orthotropic Shells
B. GEIER not available *sep. paper*

SIMULATION IN STRUCTURES

- ICAS-80-18.1 Simulation - Using Computer-Piloted Point Excitations - of Vibrations Induced on a Structure by an Acoustic Environment
A. BOURGINE, P. MONTEIL not available *sep. paper*
- ICAS-80-18.2 Flight Simulation Environmental Fatigue Crack Propagation in 2024-T3 and 7475-T761 Aluminium
R.J.H. WANHILL 645

FATIGUE CRACKS

- ICAS-80-19.1 Theoretical and Experimental Studies of Crack Propagation
J.M. THOMAS, D. ALLIAGA 652
- ICAS-80-19.2 A Practical Method for Predicting Flight-By-Flight Crack Growth in Fighter Type Aircraft for Damage Tolerance Assessment
M. LEVY, A.S. KUO, K.P. GRUBE 666
- ICAS-80-19.3 The Role of Simplified Crack Growth Prediction Methods in the Design and Maintenance of Aircraft
A. SALVETTI, V. GIAVOTTO, G. CAVALLINI not available *sep. paper*

On design of damage tolerant built-up aircraft structures

- BUCKLING
A. SALVETTI, G. CAVALLINI, V. GIAVOTTO

- ICAS-80-20.1 Recent Advances with the 'Experimental Method Fokker (EMF)' to Predict Critical Loads of Stringer-Stiffened Panels
J.H. VAN DER SLOOT 676
- ICAS-80-20.2 Computerized Stability Analysis Using Measured Initial Imperfections
J. ARBOCZ, C.D. BABCOCK 688

DURABILITY

- ICAS-80-21.1 Durability and Damage Tolerance Assessment of a Main Fuselage Frame of the AJ-37 Aircraft
P. SINDELAR . *withdrawn* not available
- ICAS-80-21.2 Operational Durability of Airframe Structures
R.J. SCHLIEKELMANN 702
- ICAS-80-21.3 Crack Propagation Analyses of Built-Up Structures
L. SCHWARMANN 713
- ICAS-80-21.4 A Comparison of Anodize Processes on the Strength and Durability of Adhesively Bonded Aluminium
O.-D. HENNEMANN 723

Fuel consumption aspects of some noise
 abatement procedures
 N.M. STANDEN, S.E. ROSBOROUGH

AIRCRAFT OPERATIONS I

ICAS-80-22.1	Energy Costs of Some Aircraft Noise Abatement Procedures N.M. STANDEN, R.E. JONES	not available <i>sep. paper</i>
ICAS-80-22.2	Investigation of the Stalling Characteristics of a General Aviation Aircraft R.F. STENGEL, W.B. NIXON	729
ICAS-80-22.3	Procedures to Improve Flight Safety in Wind Shear Conditions R. KÖNIG, P. KRAUSPE, G. SCHÄNZER	744

AIRCRAFT OPERATIONS II

ICAS-80-22.4	Aircraft Performance Optimization by Forced Singular Perturbation J. SHINAR, A. MERARI	758
ICAS-80-22.5	New Flight Control Modes for Civil Transport Aircraft V. ADAM	not available <i>sep. paper</i>
ICAS-80-22.6	Optimal Flight Vehicle Design and Linear Vector Spaces S.M. RAMACHANDRA	773

X/ Flight control modes for control of aero-
dynamic state parameters
V. ADAM

WIND TUNNEL TECHNIQUES I

ICAS-80-23.1	Three Years of Operation of the ONERA Pressurized Subsonic Wind Tunnel J.-M. CARRARA, A. MASSON	778
ICAS-80-23.2	DFVLR-Dynamic Model Testing in Wind Tunnels for Active Controls Research K. WILHELM, B. GMELIN	793
ICAS-80-23.3	Adaptable Wind Tunnel Walls for 2D and 3D Model Tests U. GANZER	808

WIND TUNNEL TECHNIQUES II

ICAS-80-23.4	A System for Model Access in Tunnels with an Unbreathable Test Medium R.R. HOWELL, S.D. JOPLIN	817
ICAS-80-23.5	Wind Tunnel Wall Interference in a Test Section with Ventilated Walls H. SAWADA	823

SYSTEMS

ICAS-80-24.1 Ground Testing of Aircraft Antistatic Protection 837
J. TAILLET

ICAS-80-24.2 Wind Shear Detection from PCM-Recorded
MLS-Flight Data 847
P. VÖRSMANN, M. SWOLINSKY

ICAS-80-24.3 ECS Integration for Fuel Efficient /
Low Life Cycle Cost Design 856
V.K. RAJPAUL

THE INTERNATIONAL COUNCIL OF THE
AERONAUTICAL SCIENCES 862

ICAS PROGRAM COMMITTEE 863

ICAS MEMBER ASSOCIATIONS 864