

B. Matthew Knapp

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Goal

Seeking a challenging position applying my experience and skills in aerodynamics, aircraft design, wind tunnel and flight test, aircraft performance, stability and control.

Education

Massachusetts Institute of Technology

S.M., Department of Aeronautics and Astronautics, 1996. Degree awarded under the "Engineering Internship Program" which involved a six month internship with the Boeing Company. Thesis work started at Boeing on a multi-variable nonlinear wing planform optimization computer code. Thesis involved applications of the code for transport aircraft wing design. Course concentration in fluid mechanics.

S.B., Department of Aeronautics and Astronautics, 1995. Strong background in the basic engineering disciplines of structures, thermodynamics, and propulsion with extra concentration in fluid mechanics. Built and tested a wind tunnel model. Wrote aircraft performance analysis code for high altitude surveillance type vehicle. GPA 4.1/5

Other Training

National Test Pilot School, Mojave California

Completed the 2 week introduction to fixed wing flight testing course, July 2004.

Skills

Senior Aerodynamicist, Flight Sciences Manager, Aircraft Design

- Aircraft prototype development leading to the successful flight of the ATG Javelin prototype in September 2005.
- Aerodynamic design including airfoil optimization, wing and empennage planform and sizing, high lift devices, intake aerodynamics and engine integration and fuselage design including area ruling.
- Applied Computational Fluid Dynamics (CFD) including vortex lattice, potential, Euler, airfoil design, Navier-Stokes, and aircraft icing codes (LEWICE)
- Aircraft Performance Analysis: Have authored and applied a full aircraft performance analysis calculation and presentation.
- Aircraft Stability and Control analysis, control surface sizing, control authority, and control response conformity to FAA requirements. Generation of simulation databases from wind tunnel and CFD aerodynamic data.
- Aerodynamic loads generation and application
- Extensive wind tunnel test experience with low speed, transonic, supersonic, and rotary balance testing
- Flight test planning, execution, and post-flight data reduction. Graduate of NTPS short course in fixed wing flight testing.
- Proficient in Rhino-3D, SDRC IDEAS (now Pro-E), UNIX, C, PERL, FORTRAN,

HTML, LaTeX, MATLAB, FLUENT, MGAERO, VLAERO, VSAERO, computer hardware and networking.

MK Aerospace Inc

Consultant

**December
2007 –
Present**

Independent aerospace consultant working to provide aircraft design and analysis services in the areas of preliminary design, fluid dynamics, wind tunnel testing, flight testing, and aircraft performance. Customers include Advanced Technical Services Intl. (ATSI) and AirBoss Aerospace.

**May 2003 –
February
2007**

Aviation Technology Group

Senior Aerodynamicist, Flight Sciences Manager

Full responsibility for aerodynamic design and performance analysis of the Javelin aircraft, from concept development and concluding with successful prototype flights. As priorities changed, led phase two design with emphasis on low speed capability and flight maneuverability. Expanded the Flight Sciences department to include a total of 5 engineers with responsibilities for all aerodynamics, performance, aerodynamic loads, wind tunnel testing, simulation, handling qualities, and flight test planning. FAA §23 compliance, certification planning, and application for special conditions.

- Full aerodynamic design of the Javelin to meet the high speed civil cruise target; design for performance. Applied CFD tools for initial design, area ruling, airfoil design and optimization, minimization of transonic drag rise, and reduction of aerodynamic loads.
- Engine inlet design and analysis for an extended (fighter type) inlet duct. Engine inlet ground and flight testing with Williams FJ-33 series engines.
- Wind tunnel tests, including generating model specifications, model loads, test matrix planning, test execution and post-test data analysis. Numerous low speed tests (UWAL), two transonic tests (Calspan), and two rotary balance tests (Bihrl LAMP) to determine spin characteristics.
- Full performance analysis of the Javelin aircraft using APAC, a 1-DOF aircraft performance analysis and mission optimization program which I wrote and own.
- Development of the simulation database from wind tunnel test data and verifying simulation output.
- Initial handling qualities analysis, managed full S&C and HQ development program in coordination with simulation and avionics requirements.
- Full loads development program for initial design and then for full FAR 23 loads certification in cooperation with Analytical Methods Inc.
- Developed a full program plan including estimates of cost and schedule from the preliminary design phase through type certification.
- Analyzed performance for, and developed the profile of, the first 10 test flights of the Javelin prototype which flew successfully in September of 2005.
- Responsible for determining compliance of aircraft performance, stability and control with FAA §23 certification requirements.

**May 1997-
July 2002**

Pioneer Rocketplane

Aerodynamics and Performance

Preliminary design work on the Pioneer Rocketplane concept; an all-new design of a hybrid rocket-aircraft capable of aircraft operations on jet engines, and hypersonic, sub-orbital (Mach 12) operations on rocket power. Responsible for all aerodynamic and atmospheric performance analysis of the aircraft, including wing planform sizing, control surface definition, and mission profile optimization.

- CFD analysis of the design and design evolution; work done in partnership with Analytical Methods Inc. in Redmond, Washington. Used Vortex Lattice, Potential and Euler Methods. Results of the CFD analysis were used to drive the design through 3 major iterations.
- Worked with NASA Ames on aero-thermal requirements for re-entry heating, stability and control. Integrated results into low speed aerodynamic design.
- Planned a suite of wind tunnel test to evaluate the performance of the aircraft from low speed through hypersonic Mach numbers. Executed a supersonic wind tunnel test at NASA Lewis (now Glenn).
- Developed, verified, and applied a computational tool to analyze the entire aero mission performance. The code, called APAC (Aerodynamic Performance and Analysis Code) performs mission performance analysis based on available aerodynamic and power plant data.

**August 1999
– April 2003**

Analytical Methods Inc.

Aerodynamics Application Engineer

Worked in applied aerodynamics and performance on aircraft modification programs using CFD tools, aircraft performance analysis, and preparing analysis for FAA approval. Programs included winglets and radome modification projects. Also worked on CFD validation programs leading to publication #2. Computational tools include MGAERO, VLAERO, VSAERO, Fun2D, LewICE 2D and 3D, XFOIL and MSES.

1993-1995

Boeing Aircraft Company

Internship in CFD and MDO

Internship for the Boeing Company during the summers of 1993, 1994 and the latter half of 1995. 1993: worked with the High Speed Civil Transport (HSCT) performance group studying NOX emission profiles for potential HSCT engines. 1994: worked with the Boeing Advanced Testing and Development Wind Tunnel group using CFD tools to validate Ashill's method for determining wind tunnel wall effects and corrections. 1995: Worked on applying a multi-disciplinary (MDO) nonlinear wing planform optimization code for Boeing use. Work on the code was used for M.S. at MIT in 1996

Awards

Massachusetts Institute of Technology

James Means prize for "Excellence in Flight Vehicle Engineering" for work on a UAV design project, 1995.

Leaders for Manufacturing Undergraduate Prize for work on wind tunnel testing a C-Wing transport design, 1994.

Publications

Mission Optimization for a Reusable Launch Vehicle System, AIAA 99-4932, 9th International Space Planes and Hypersonic Systems and Technologies Conference, November 1999.

"MGAERO Validation using KC-135 Flight and Tunnel Data", AIAA 2000-4021, with Dave Lednicer, Analytical Methods Inc. Conference

**Other
Interests**

Certified flight instructor (CFI) for single engine aircraft and with 400 hours CFI time, and over 1000 hours total time including commercial, instrument, and multi-engine

ratings.

2nd degree black belt in Tae Kwon Do and Hap Ki Do (Martial Arts)

Enjoy rock climbing, biking, international bicycle touring, photography, hiking, and back-country telemark skiing