



Figure 8: The contributions of parasitic, the wave drag and the induced drag as well as the total drag.

models for different parts of the envelope has been combined into continuous functions that can be used for flight simulation. One conclusion is that supersonic induced drag can be substantial and needs to be considered in conceptual design. Even though the velocity is high, the induced drag coefficient goes up when leading edge suction is lost. In addition the neutral point is moved backwards increasing the need for trim that is further increasing the induced drag.

References

- [1] Edwin J. Saltzman and John W. Hicks. In-flight lift-drag characteristics for a forward-swept wing aircraft and comparisons with contemporary aircraft). Technical report, NASA Technical paper 3414, 1994.
- [2] Petter Krus, Robert Braun, and Peter Nordin. Aircraft System Simulation for Preliminary Design. In *28th International Congress of the Aeronautical Sciences*, Brisbane, 2012. ICAS.
- [3] Alvaro Martins Abdalla, Grönstedt Tomas Gazetta, H., and Petter Krus. 4:th CEAS European Air & Space Conference. In *The Effect of Engine Dimensions on Supersonic Aircraft Performance*, Linköping, 2013. Linköping University Electronic Press.
- [4] Christopher Jouannet and Petter Krus. Unsteady aerodynamic modelling: a simple state-space approach. In *AIAA Aerospace sciences meeting and exhibit*, Reno, USA, 2005.
- [5] John D. Anderson. *Introduction to Flight, Fourth Edition*. WXB/McGraw-Hill, 2000.
- [6] Daniel P Raymer. *Aircraft Design: A Conceptual Approach*. AIAA, 6th edition, 2018.
- [7] Wolfgang Haack. *Geschossformen kleinsten Wellenwiderstandes*, 1941.
- [8] Richard T Whitcomb. A study of Zero-Lift-Drag-Rise Characteristics of Wing-Body Combinations Near the Speed of Sound. Technical report, NACA Technical Report 1273., 1956.
- [9] Richard T Whitcomb and Thomas C Kelly. A Study of the Flow over a 45 Degree Sweptback Wing-fuselage Combination at Transonic Mach Numbers. Technical Report April, NACA-RM-L52D01, 1957.
- [10] Robert T. Jones. Theory of wing-body drag at supersonic speeds. Technical report, NASA, 1953.
- [11] Raghu Chaitanya Munjulury, Ingo Staack, Alvaro Martins Abdalla, Tomas Melin, Christopher Jouannet, and Petter Krus. Knowledge-based design for future combat aircraft concepts. In *29th Congress of the International Council of the Aeronautical Sciences (ICAS 2014)* :. The University of São Paulo (USP), Brazil, 2014.
- [12] Raghu Chaitanya Munjulury, Alvaro Martins Abdalla, Ingo Staack, and Petter Krus. Knowledge-based future combat aircraft optimization. In *30th Congress of the International Council of the Aeronautical Sciences (ICAS 2016)* :, Belo Horizonte, Brazil, 2016.
- [13] Raghu Chaitanya Munjulury and Alvaro Martins Abdalla. Analysis of Radar Cross Section and Wave Drag Reduction of Fighter Aircraft. In *Aerospace Technology, FT2016*, Stockholm, Sweden, 2016.
- [14] Matheus Urzedo Quirino, Mathieu Calvo, Raghu Chaitanya Munjulury, and Alvaro Martins Abdalla. Analysis of the influence of the external configuration on the wave drag of supersonic business jets. In *31st Congress of the International Council of the Aeronautical Sciences, ICAS 2018*, Belo Horizonte, Brazil, 2018.