DARcorporation

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What's New in AAA?

Version 2.3

April 2001

DARcorporation is proud to announce the release of **Advanced Aircraft Analysis (AAA), Version 2.3**. Those of you already familiar with the versatility and clarity of AAA 2.2 will be even more pleased with the introduction of Version 2.3. New features and submodules will become quite evident to AAA users accustomed to Version 2.2 while dozens of improvements and modifications heighten the program's efficiency and precision.

Through customer feedback, AAA users have supplied ideas for new features. Some requests involve entirely new analysis modules while others seek the extension of existing ideas. All of these new features are described in Parts II and III of the User's Manual.

Section 1 shows the enhancements and modifications made to AAA. Major enhancements are new modules and new calculations. The second section contains bug fixes. Many of these bug fixes deal with extreme cases such as division by zero or square roots of negative numbers when non-conventional configurations are designed.

1. Enhancements and Modifications

A module-by-module overview of the differences between AAA 2.2 and AAA 2.3 is listed below.

1.1   Weight

Class II Moments of Inertia based on Chapter 10 of Airplane Design Part V has been added

1.2   Aerodynamics

1. A **Drag/Class II/Floats** submodule has been added.
2. Addition of **Aerodynamic Center** data to account for floats is incorporated in this version.
3. Triple Slotted flaps are now added to the **Lift/Flaps** and to the **Drag/Class II Drag/Trail. Edge Flap** submodules.
4. Lift coefficient calculation as function of angle of attack, incidence and control surface deflection is added. This allows for calculation of untrimmed lift coefficients
5. Pitching moment coefficient calculation as function of angle of attack, incidence and control surface deflection is added.
6. Untrimmed Class II drag polar is added
7. Trendline is added to Class II drag to approximate the drag polar with a 5th order equation in lift coefficient.
8. Fuselage diameter is replaced with width in Class II wing, canard and horizontal tail drag.
9. Trim Drag: removed calculation of trimmed lift coefficients to prevent confusion

1.3   Performance

No Changes

1.4   Geometry

1. A **2-Dimensional/Wing/Fuel Volume/Class II** submodule has been created to provide more detailed wing fuel tank volume calculations.
2. AAA 2.3 accounts for a reduction in fuel volume due to spar locations and fuel tank inboard and outboard stations, as well as a reduction in volume due to fuel expansion.
3. Control Surface Geometry is added to each lifting surface.
4. Fuselage diameter is replaced with fuselage width in the cranked wing module.
5. Each component can be exported to Aero-CADD separately.

1.4.   Propulsion

No Changes

1.5. Stability and Control

1. Aerodynamic center shift due to floats is added.
2. Stickforce gradient is added in Class II Longitudinal Trim Analysis
3. Pedal free directional stability is added in Class II Lateral-Directional Trim Analysis.
4. Lift curve slope for the rolling moment derivative due to roll rate is now for the current flight condition.

1.6. Dynamics

No Changes

1.8 Loads

No Changes

1.9 Structures

No Changes

1.10 Cost

Cost escalation factor is updated to account for inflation throughout the year 2000

1.11 General

1. The software environment has been changed from 32-bit to 16-bit to increase speed. Previous 16-bit AAA versions were originally developed for the Microsoft Windows 3.1 environment.
2. AAA network version installation has been simplified.
3. Long file names and directory names may be used. Previously only 8 character filenames were allowed.
4. Now only one project file is created instead of having a project directory created each time a new AAA file is saved.
5. A "recently used file names list" to save time loading recent files is added.
6. Tables, input / output data and data used to construct curves on plots can now be exported to ASCII files.
7. Move and copy flight condition are added in the **Flight Condition** window.
8. Notes can be printed.
9. Exporting files now warn before an existing file is overwritten.

2. Bug Fixes

3.1   Weight

1. Class II Weight/Structures/Fuselage: the calculation for non-pressurized General Aviation airplanes has been corrected.   For the Cessna method several input variables were missing.
2. Class II Weight/Powerplant/Air Induction: the average weight is incorrect.
3. Loading a AAA 2.1 project with powerplant weights causes a crash.
4. Class II Weight/Fixed Equipment/Operational Items: Torenbeek method should not be used for General Aviation type category.

3.2   Aerodynamics

1. Class I drag plotting: scaling of axes has been fixed.
2. Plotting Windmilling Drag did not check if all input is available.
3. Power effects: wing lift coefficient calculation did not include incidence
4. Aerodynamic center of flying wings needed horizontal tail input.
5. Power effects needed a horizontal tail to calculate.
6. Flap Lift: Type II Double Slotted Flaps, the effective turning angle is calculated incorrectly.
7. Airplane Lift: Zero-lift-angle-of-attack is calculated from zero-angle-of-attack lift coefficient and lift curve slope.

3.3   Performance

No Changes

3.4   Geometry

1. Changing number of fuselage stations causes error messages
2. Changing number of pylons in Aero-CADD geometry causes error messages.
3. Cranked Vertical Tail: dihedral and root y-location are fixed.

3.5   Propulsion

The subsonic jet inlet extra drag calculation has been corrected to match Design Part VI.

3.6   Stability and Control

1. Derivatives/Lat.-Dir. Control/Spoiler: yawing moment calculation has been corrected.
2. Analysis/ C_{m_O} /Total: Calculation has been corrected for configurations with no horizontal tail.

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3. Analysis/C_{m_o}/Total: The clean zero-angle-of-attack-lift-coefficient should be used instead of zero-angle-of-attack-lift-coefficient including flap effects.
4. Crash in roll rate derivatives if no vertical tail is selected.
5. Design Part VI fig 10.45: for AR > 8 the figure is incorrectly extrapolated.
6. Mach number is missing in yaw rate derivatives for twin vertical tails.
7. When two solutions are presented in Class I analysis for surface area, the conversion from SI to British units is done incorrectly.
8. Side force due to sideslip: missing inputs gap factor, lift curve slope.
9. Flying wing calculations are allowed (no need for a horizontal tail) in S&C derivatives.
10. Thrust coefficient due to speed calculation did not match Airplane Design Part VI.
11. Trim diagram: the lift axis cannot be scaled properly.
12. Elevator and canardvator drag control derivatives: airplane lift coefficient is replaced with airplane zero-angle-of-attack lift coefficient.
13. Rolling-moment-due-to-yaw-rate and yawing-moment-due-to-roll-rate account for flap effects incorrectly.

3.7 Dynamics

Printing of transfer functions has been updated

3.8 Loads

1. Conversion factors for values in tables for lb to N are corrected.
2. Flaps geometry was used incorrectly in "Definition of Moving Surfaces Loads".
3. Random symbols showed up on the "Choose Attachment for Load Component" window instead of "Left Wing".
4. Instruments/Avionics/Electronics weights and c.g.-locations do not show up in the table under fuselage/conc. Weights.

3.9 Structures

No Changes

4.0 Cost

No Changes

4.1 General

1. Entering values in inputs that are too small or too big cause permanent error messages to popup when selecting info or the notes button.

2. Loading big projects and clicking on flight condition while the project is loading causes error messages.
3. Flight Condition: editing the flight condition name and then selecting Cancel causes error messages.