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What's New in AAA?

Version 3.11

July 2007

AAA 3.11 contains various enhancements and revisions to version 3.1 as well as bug fixes. This version has over 280,000 lines of code and over 4,400 unique input/output variables.

Section 1 shows the enhancements and modifications made to AAA. Major enhancements include new modules and calculations. The second section contains bug fixes.

The AAA Manual describes the installation procedure and all modules. The manual is available in pdf format on the installation CD.

1. Enhancements and Modifications

A module-by-module overview of the differences between AAA 3.1 and AAA 3.11 is listed below.

1.1 Weight

1. A variable, $N_{crew_{other}}$, has been added and N_{crew} is now an output equal to $N_{pilots} + N_{crew_{other}}$.

1.2 Aerodynamics

1. Mach number is calculated as an output in Flap Sizing. Altitude, Temperature Increment and Speed are inputs for flap sizing.
2. The friction coefficient, C_f, is calculated as an output for all components in Class II Drag.
3. Class II Nacelle Drag result is now expressed in terms of nacelle zero-lift drag and nacelle induced drag separately in the Total Drag module.
4. Power effects are based on methods discussed in DATCOM and Airplane Design: Part VI by Dr. Jan Roskam.

1.3 Performance

1. A warning message appears explaining how the $C_{L_{AR}}$ variable is used in the calculation.

1.4 Geometry

1. Maximum fuselage width, maximum fuselage height, fuselage base area and fuselage wetted area are calculated as output in the Fuselage Geometry window.
2. Propeller geometry can be exported from the AeroPack module.
3. Class I and Class II drag polar legends now show S_w instead of S.
4. AeroPack scales the fuselage cross sections with respect to the window.

1.5 Propulsion

No Changes

1.6 Stability and Control

1. In Take-off Rotation, if horizontal tail area is negative, a warning message appears indicating what the problem is.
2. C_{y_β} , C_{l_β} and C_{n_β} : Twin vertical tail dynamic pressure ratio is now calculated.

1.7 Dynamics

1. The scale of the axes of the flying quality plots can be changed.
2. Print transfer function and total system with poles and zeros using Print System button.

1.8 Loads

No Changes

1.9 Structures

No Changes

1.10 Cost

Cost Escalation Factor (CEF) is updated.

1.11 General

1. More GOTO buttons have been added to variables.
2. When exporting plots with multiple curves to Excel, the data for each curve are placed in columns next to each other.

2. Bug Fixes

This section lists bugs found in AAA 3.1 and earlier versions which are fixed in AAA 3.11.

2.1 Weight

1. Class II Landing gear retraction factor, $K_{retract}$ is the same for main and nose gears.
2. Class II Weight Iteration message is not specific on which data is missing.
3. In Class II Weight > Structure the wing component cannot be opened when there are no nacelles.
4. In Class II Wing weight correction factor is calculated incorrectly.
5. For Class II Landing Gear weight, there are no GD method outputs.
6. Weight Sizing Regression Plot gives an error message when the default axes are changed.
7. In the Class II Weight Iteration for a commercial aircraft with integral fuel tanks, the GD method value is not used; but the value is automatically set to 0, which affects the average.
8. The variable name overwrites the description in the work pad for the Wing Linked Components variable in the Forward-Aft CG module.
9. Class II vertical tail weight for a flying wing configuration checks for horizontal tail inputs.
10. The weight at forward CG is incorrectly calculated for certain loading scenarios in the Fwd/Aft CG module.

2.2 Aerodynamics

1. α_0 and c_{l_α} at Mach number are not calculated from $\alpha_{0_{@M=0}}$ and $c_{l_{\alpha_{@M=0}}}$ respectively in Lift Distribution module.
2. In the Fuselage Structure module of Class II Drag, the GoTo button for wetted area takes the user to a page without wetted area.
3. For vertical tail sideforce, rudder and tab effect are added instead of subtracted.
4. Downwash Gradient calculation is incorrectly defined.
5. Airplane pitching moment output for Zero Lift should be clean.
6. Class II Drag calculation not performed in Recalculate when Trimmed Lift is also checked.
7. The number showing the 'identity' of the curve can be outside of the plotting area in the Class II Drag plot.

8. In the Power Effects module, SHPset should not have the word installed in its help.
9. Pylon and Nacelle tables are not flight condition dependent.
10. For a fixed landing gear configuration, Class I Drag Polar plots should not show gear up parameters.
11. Drag numbers do not match up at M=1.2 for transonic range (0.8-1.2) and supersonic range (1.2-1.8) for fuselages, V-Tails, Canards, Horizontal Tails, Pylons, Wings, and Nacelles.
12. If nacelles are not defined and Power Effects is selected, the wrong dialog window is brought up to define the nacelles.
13. For Class II transonic/supersonic drag plots, C_D jumps approximately 10 drag counts when transitioning from the transonic to supersonic regimes (at M=1.2).
14. The effect of the canard on the wing is incorrectly calculated in Power Effects.
15. There are no warnings when switching between flight speed regions in Class II Drag.
16. For the Canard Downwash onto Wing window, if power effects are included the GoTo button for $\Delta\left(d\varepsilon_w/d\alpha\right)_{power}$ gives an access violation error.
17. Critical Mach number is incorrectly calculated for negative sweep angles.
18. Incorrect values are given for $C_{L_{\alpha_{py}}}$ and $C_{y_{\beta_{py}}}$ when the pylon has a -90° dihedral.
19. Class II trim drag does not show tabs if tabs are defined.
20. Wing critical Mach number return zero values for large C_{L_w} and t/c values.
21. Inflow factor term is missing in the calculation of C_{nT_β} .
22. If there is no horizontal tail, one cannot open the Dyn. Pres. Ratio module.
23. Trimmed functionality in Class II drag polar does not account for nacelles and pylons.

2.3 Performance

1. For a Single Engine configuration, Climb Sizing input/output window shows inputs for OEI cases.
2. C_{L_0} , C_{L_α} , $C_{L_{\max}}$ are shared variables in the Clean and Current Flt Condition. sub-modules under Performance Analysis module.
3. Performance Sizing Climb requirements for a fixed gear configuration show gear-up parameters.
4. For an LSA category airplane, the VLOF factor used to calculate the Lift-off speed is 1.1
5. For instantaneous maneuvers, there is no need for P_{Avail} or P_{req} because they have no influence on load factor.

6. The read-off labels for Payload-Range plots do not display properly.
7. When η_p is changed, P_{req} changes instead of P_{av}.

2.4 Geometry

1. Old files with Fuselage segment length and width data are ignored.
2. The conversion between British and S.I. units on X-axis of Fuselage Geometry plot is incorrect.
3. Legend covers up information about the second Y-axis of Fuselage Geometry plot.
4. When using the AeroPack export, airfoils are exported in the vertical plane rather than in the lifting surface reference plane.
5. AeroPack module does not read in Pylon geometry when using the import functionality.
6. Fuselage cross sections in AeroPack are scaled with respect to the window.

2.5 Propulsion

1. Inlet Area calculation under Inlet Design gives a warning that the methods are valid only for incompressible flow.
2. Using the help button to set the value in SI units for ΔP_{hydr} creates a Microsoft Help Error.

2.6 Stability and Control

1. AAA does not calculate $C_{l_{ph}}$ if the parameter $\beta \frac{AR}{K} < 1.5$.
2. Class I Stability & Control Analysis uses clean stall speed to calculate V_{mc}.
3. An invalid floating point operation error occurs when plotting with 2 elevator deflections in the $C_{L_{\delta e}}$ module.
4. $C_{y_{\delta r}}$, $C_{l_{\delta r}}$ and $C_{n_{\delta r}}$ plots do not match calculated values.
5. In the Stick Force module, F_s does not update with the speed, U_1.
6. $C_{M_{T1}}$ and horizontal tail angle of attack are not recalculated at the end of the Trim Horizontal Tail Lift Coefficient iteration.
7. $C_{n_{\delta rv}}$ is not implemented in the One Engine Out sub-module of Stability & Control module for V-tails and Ruddervators.
8. In Class I: De Facto Stability, variable incidence stabilizers or canards are not accounted for.

9. The rolling and yawing moment coefficients due to the spoilers will not calculate unless a spoiler deflection angle is defined.
10. If no vertical tail or v-tail is defined when rudder force is selected (Analysis>Rudder Force) nothing happens. There needs to be a prompt telling the user to define a vertical tail or v-tail.
11. The solutions for F_r and δ_r in Class II > Lat.Dir Trim > Straight Flight do not converge. Calculate must be pressed three or four times to get a converged answer.
12. In Lat-Dir Trim > Turning Flight, a floating point error occurs if a rudder deflection other than zero is specified.
13. Trim diagram for pusher-prop configurations gives error.
14. Class II Trim diagram for a stabilizer gives a floating point error when $\frac{d\varepsilon}{d\alpha}$ is set to 1 and then changed to another value.
15. TO Rotation uses T_{avail} instead of T_{TO}.
16. In Stab. & Control > Analysis > Class II > Trimmed Lift > for certain configurations of flying wings, a warning message window with no message is displayed.

2.7 Dynamics

1. For sensitivity plots, the axes are incorrect when the units are changed from rad^{-1} to deg^{-1}.
2. The denominator of the transfer functions shows a fourth degree polynomial in the polynomial form, but a sixth degree polynomial in the factored form.

2.8 Loads

1. The V-n Diagram module does not work for a LSA.
2. V-n Diagram plotted for FAR 23 normal certification: Upper gust lines are not always connected properly.

2.9 Structures

No Changes

2.10 Cost

No Changes

2.11 General

1. If a flight condition is not given a name, or the name is deleted using the Edit button, no warning is given and an access violation error occurs.
2. Opening a AAA file by double-clicking on it launches AAA with an error message.
3. Input/Output tables with Input/Output headers and a column separator cannot be imported.