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What's New in AAA?

Version 3.6

July 2014

AAA 3.6 contains various enhancements and revisions to version 3.5.1 as well as bug fixes.

Section 1 shows the enhancements and modifications made to AAA. Major enhancements include new modules and calculations. Section 2 contains problem 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

Differences between AAA 3.6 and AAA 3.5.1 are:

1. Bodies are sorted on X value upon calculate.
2. If the inboard and/or outboard flap chord ratios are not defined, the average flap chord ratios are used for plotting.
3. Control surface tip shape and nose shape is required before the I/O window will open for the hingemoment module.
4. Both trimmed and untrimmed drag polar trendlines can be calculated simultaneously.
5. Drag polars are sorted for increasing deflection angle upon calculate.
6. Differential stabilizer is added to roll performance in the Flying Qualities module.
7. Lift and moment calculations for aircraft in ground effect are in separate modules.
8. Ground effects plots the wind-fuselage lift coefficient versus angle of attack in and out of ground effects.
9. There is a separate module for the downwash due to ground effects on the vertical tail
10. Differential stabilizer variables have the subscript δ_h.
11. Dorsal fin geometry is implemented.
12. Dorsal fin drag is implemented.
13. Dorsal fin weight and CG is calculated.
14. Dorsal fin effects are included in power effect module.
15. User defined weights can be negative to account for the removal of objects included in the empty weight of the aircraft.
16. The Airfoil Location is defined in a pull down menu on the toolbar.
17. The curves that define the propeller and spinner are clipped in the three-view module.
18. Left and right mission fuel groups are accounted for in the Loads Module.
19. Floats, stores and pylons are included in the Class II weight iteration table.
20. Wing alone pitch break stability is calculated.
21. Propeller efficiency tables can be read into AAA through Hartzell propeller files or text files.
22. Printer options are modified to be more user-friendly.
23. Wing structure type is no longer required for maximum cruise speed performance sizing.
24. $\delta_{r_{rv}}$ is shown in the Angles module under Geometry.
25. Pylon, nacelle, store and tailboom wetted areas are shown in the output of the Class II Drag Recalculate All module.
26. The coefficient of determination (R^2) value is shown for drag polar trend lines.
27. Missing spoiler and/or speed brake drag data is no longer warned against if the speed brake and/or the spoiler are retracted in the flight condition.

28. Only one trim surface can be defined per flight condition.
29. Only applicable components can be selected for drag polar calculations and plotting purposes.
30. Class II Total Drag module is renamed to Airplane to be consistent with the other aerodynamics modules.
31. C_{D_α} uses the airplane drag polar instead of the drag trend line.
32. Control surface deflections, other than the trim surface, are shown as inputs in the Trimmed Lift T from D module.
33. Aileron and flap geometry are plotted on the planform, if defined.
34. $C_{L_{misc}}$ and $C_{m_{misc}}$ tables are automatically filled with zero by default.
35. Control surfaces are the same color when plotting the planform.
36. Section c_{l_α} properties can be inputs for the pylon root and tip sections.
37. Tables show which variables are locked.
38. Tables show changes to any output variable after calculate is pressed.
39. Effective aspect ratio of the vertical tail is calculated if the horizontal tail is very far away.
40. Spinners are exported to AeroPack.
41. Canopy is exported to AeroPack.
42. Pylon Group C.G. location is shown in Class II inertias.
43. Dorsal fin moments of inertia are calculated
44. Fuselage Y_{cg} is set to the Y-location of the apex.
45. Nacelle group C.G. location is used in calculating the nacelle moments of inertia.
46. Control surfaces can be exported independent of corresponding lifting surface.
47. Nacelle group $Y_{c.g.}$ is calculated using the nacelle toe angle.
48. Float, store and tailboom group calculate the Y-location of the center of gravity.
49. Mach variation per flight condition is implemented.
50. Canopy geometry can be defined.
51. MT propeller performance maps can be plotted.

2. Problem Fixes

This Section lists the problems found in AAA 3.5.1 and earlier versions, which are fixed in AAA 3.6.

2.1 Weight

1. Access violation error if mission profile module is accessed for a new file and immediately after the module is accessed, the take-off weight module is accessed.
2. Air induction weight does not calculate even though all input parameters are filled in.
3. User defined weight and moments of inertias are not included in total moment of inertia.
4. User defined inertias should be allowed to be zero.
5. Some Vought method parameters are scaled with the geometry when they should not be.
6. The calculation of the ventral fin center of gravity is incorrect.
7. There is a floating point error if the number of main gear shock struts is zero.
8. Fuselage structure weight should not require the definition of ventral fins.
9. Store inertia is not included in the airplane total inertia.
10. Pylon weight is not allowed to be zero in Total Structure module.

2.2 Aerodynamics

1. Power Effect condition should be asked when entering the linear and non-linear lift modules for all lifting surfaces.
2. There is a warning saying that the high lift device drag is not filled in for transonic and supersonic flight conditions.
3. There is a warning in Class II Drag saying that there is high lift device drag data is missing when double slotted flaps are used in combination with other types of flaps or slats.
4. Leading edge device drag is not added in total high lift drag coefficients.
5. If the aspect ratio is greater than 6 and there are multiple flaps, one of which is a plain flap, the change in angle of attack due to ground effect is calculated incorrectly. The slotted and split flaps will be skipped in the calculation.
6. Class I Drag does not ask for the landing gear to be defined when entering the module.
7. The Zero-Lift drag coefficient will not calculate in Class II Total Drag unless the drag polar is defined.
8. Changing the number of rows in the angle of attack table for $C_{L_{misc}}$ causes a series of error messages in $C_{m_{misc}}$ and vice versa.
9. Setting the number of α rows in one flight condition and checking the box to make the value the same for all flight conditions causes a series of error messages in the other flight conditions.

10. There is an invalid floating point error if the trimmed and untrimmed $C_L - C_D$ plot is attempted for wing only.
11. No warning message pops up when trying to access the High Lift device module for airplane C_{m_o} when there are no flaps.
12. Ground Effects must be specified before entering the Lift, Aerodynamic Center and Class II Drag modules.
13. The drag coefficient is off when plotting multiple flaps.
14. The trim surface is requested before any control surface definition is requested when entering the wind tunnel drag module.
15. Inlet and Nozzle drag should be shown as inputs in the Class II Recalculate All module.
16. Class II Drag polar will not plot unless flight path angle is defined.
17. Elevator deflection is shown in Trimmed Lift module if no elevator is defined.
18. V-tail induced drag is not included in the total drag summation.
19. Class II landing gear drag should use wing lift coefficient, not airplane lift coefficient.
20. Propeller tables must be added to the Windmilling module in Class II Drag.
21. GoTo button is missing for ε_{w_o}.
22. Inlet and nozzle drag parameters should be shown as outputs of the Recalculate All Class II Drag module.
23. f_{gap} for all lifting surfaces is not used in the calculation of lifting surface drag.
24. There is a floating point error in the calculation of the pitching moment due to power effects if the propeller diameter is greater than the wing span.
25. Tab variables are missing in the Non-linear C_{y_β} module for vertical tails.
26. $C_{L_{misc}}$ should be included in the calculation of C_{L_1}.
27. $C_{m_{misc}}$ should be included in the calculation of C_{m_1}.
28. Immersed areas for horizontal and vertical tail are not calculated even though all input parameters are defined.
29. Vertical tail immersed area is not calculated correctly for twin vertical tails with two propellers.

2.3 Performance

1. There is an invalid floating point error on calculate in the Maximum Cruise Speed module.
2. Y-axis of the Sizing plot does not update correctly if SI units are used and the axis limits are changed.
3. Disk Loading is not calculated correctly for military take-off performance sizing.

2.4 Geometry

1. Flap geometry is plotted incorrectly. Only the inboard flap chord ratio is used.
2. Flap geometry will not plot in Flap sizing if inboard and outboard chord ratios are not defined.
3. Invalid floating point operation error in fuselage geometry if two cross sections have the same X-location.
4. Vertical tail tip X-location is not calculated correctly for straight tapered planforms.
5. Horizontal tail thickness ratio at the mean geometric chord should be flight condition independent.
6. The Ventral Fin button does not return to the default condition if no ventral fin is selected.
7. If store data is filled out and selected in the AeroPack module and landing gear is selected, but no geometry data is defined, the store option will be de-selected.
8. Ellipse drawn to represent propeller does not clip if it is outside the drawing area and show up as phantom curves in other views.
9. If more cross sections are defined with a finer x-spacing than $l_f/90$, the body geometry calculations of volumes, wetted areas and fuselage height could be incorrect.
10. The default three-view scaling could go to infinity under certain conditions.
11. A check needs to be added to the three-view to see if vertical tails are outside of the span of the horizontal tails and modify the default view accordingly.
12. If the airfoil .dat file is in the wrong format, a series of invalid numeric input errors pop up.
13. There is a floating point error if the fuselage z coordinates are not defined correctly.
14. The wing sweep angle is not calculated correctly for the MGC based methods. This is most noticeable in wings with low taper ratio.
15. There should be no error message in the Exposed horizontal tail module if the Y_{offset} is greater than the calculated span.
16. There is a floating point error on export to Aeropack when exporting a horizontal tail with zero dihedral.
17. Calculated planform is incorrect if the last panel has a dihedral of 90 degrees to simulate a winglet.
18. Exposed area is incorrect if there is a Y_{offset}.
19. Body geometry cross section definitions at the exact same body station will cause AAA to crash.
20. The airfoils for the pylon are not imported correctly into Shark using AeroPack.
21. AeroPack export of propellers does not correctly display the incidence or toe angles.
22. Components that are not part of the current configuration are not greyed out until clicked on for the AeroPack Export.
23. Partially shielded horn balance calculation is not correct.

2.5 Propulsion

No Changes

2.6 Stability and Control

1. Take-off Rotation should ask whether Power Effects are on or not.
2. Take-off Rotation calculation crashes AAA if the denominator of the area equation is zero.
3. Take-off Rotation Module is missing dynamic pressure ratios for the power effects off case.
4. Take-off Rotation Module will not calculate if power effects are on.
5. Input parameters do not fill screen and are only in 4 columns for the Take-off rotation module for configurations with horizontal tail and canard.
6. There is no warning message when trying to access rudder parameters in the Stability & Control wind tunnel module if there is no vertical tail and therefore, no rudder.
7. There is an access violation error if Class I inherent surface area method is used for Class I Stability & Control for configurations with no horizontal tail, V-tail and/or canard.
8. Rudder deflection is missing from the input parameters for the calculation of C_{n_r} and C_{l_r}.
9. Ruddervator deflection is missing from the input parameters for the calculation of $C_{n_{rv}}$ and $C_{l_{rv}}$.
10. There is no warning message when trying to access the Pedal Force module for Flying wings without vertical tails.
11. Trim Diagram will not plot even though all input parameters are filled in.
12. There are multiple warning messages when plotting the Trim Diagram for a flying wing that is not trimmable.
13. Variable control surface deflections are not taken into account if the wind tunnel drag polar is used in the Trim Diagram.
14. There is no warning message if no trailing edge flap has been defined in the Hingemoment module
15. Negative power output creates an error in the propeller inflow.
16. Elevator and canardvator deflection angles are displayed in the Trim Diagram plot even if there is no elevator and/or canardvator.
17. For 3-Surface aircraft, both control surface deflections are shown in the output of Trimmed Lift T from D. This could result in more than one trim solution and may produce an erroneous result.
18. Propeller effect should be removed from the trim diagram such that only aerodynamic C_{L_1} is shown on the Y-axis and not include the propeller thrust and normal force components.

19. For propeller airplanes, the trim diagram plot will update the horsepower for the wrong angle of attack.
20. The variables that relate the lift of the canard to the lift of the horizontal tail or V-tail are not needed for trim calculations.
21. Altitude, temperature deviation and Mach number should be shown as inputs in the C_{D_α} module.

2.7 Dynamics

1. There are incorrect variable names in Dynamics > Longitudinal > Sensitivity for $C_{m_{T_1}}$ and $C_{m_{T_{x_1}}}$.
2. GoTo button for Moments of Inertia about the stability axis should point to the "None" transfer function module.

2.8 Loads

1. V-n diagram warning messages should have "than" instead of "then."
2. The main landing gear is divided by two and is applied to the both halves of the aircraft.
3. Wing distributed weight will cause an Access Violation error if the wing geometry is not defined.

2.9 Structures

2.10 Cost

2.11 General

1. Help button does not work for the High Lift Device Dialog box.
2. High lift device deflections are not initialized but the text box shows zero.
3. Label elements and combo elements are not positioned correctly with a left margin when they are the first element on the I/O Window.
4. Land based or Carrier based operation selection does not show up for AS specs in the Certification Dialog window.
5. Some variables scale but should not when the aircraft is scaled
6. Opening files from before Version 3.1 should ask for ventral fin definition.
7. Calculator function does not recognize scientific notation when accessed from a variable IO element.
8. GoTo buttons truncate the decimals of variables.
9. If flap hingemoments are defined in a file from before 3.5 a database error occurs during the loading of the file.

10. The units shown in the Flight Condition Dialog box do not match the value shown if there is a unit mismatch between the forward/aft X_{cg} and the value in the Total C.G. module.
11. The limits on $AR_{v_{eff}}$ must be set close to zero.
12. The program crashes when trying to trim an untrimmable aircraft.
13. Untrimmed Drag Trendline message says there is data missing to trim the aircraft in the Recalculate All module.
14. Class I Drag polar X-axis vertical spacing is dependent on the Y-axis values.
15. Negative sign is not copied if user double clicks on the cell.
16. Locked variables in tables do not update if number is changed using the calculator in the workpad.
17. Non-integers should not be able to be entered into the work pad for spin elements.