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What's New in AAA?

Version 3.5.1 and Version 3.5

September 2013

AAA 3.5.1 contains various enhancements and revisions to version 3.5 and 3.4 as well as bug fixes.

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 – AAA 3.5.1

Differences between AAA 3.5.1 and AAA 3.5 are:

1. $C_{l_{\delta_{rv}}}$ and $C_{n_{\delta_{rv}}}$ have similar input/output parameters as $C_{l_{\delta_r}}$ and $C_{n_{\delta_r}}$
2. The limits on material weight factors have been removed in Class II Weight.
3. The pylon root sweep angle can be defined.
4. Thrust from Drag in the Propulsion module is added to the Recalculate All module.
5. Cost Escalation Factor is updated through August 2013
6. The total wetted areas for nacelles, pylons, tailbooms, stores and floats are now calculated.
7. The airplane equivalent skin friction coefficient is now calculated based on airplane wetted area, C_{D_o} and wing planform area.

2. Enhancements and Modifications – AAA 3.5

Differences between AAA 3.5 and AAA 3.4 are:

1. Multiple segmented high lift devices can now be entered.
2. There is new option for Flap or Slat definition in the configuration dialog window
3. There is an additional Payload Reload mission segment option in weight sizing.
4. The 2D c_{l_α} is calculated at the flap mid span station.
5. $\Delta\varepsilon_{h_{\delta_f}}$ is renamed as $\Delta\varepsilon_{h_{o_{\delta_f}}}$.
6. Drooped aileron selection is now combined with the Flap/Slat dialog window.
7. Drooped aileron, slat and Krueger flap deflections are shown in the “Angles” module under geometry.
8. Class II Inertias are calculated for structural components like wings, empennage, nacelles, fuselage etc.
9. Cranked wing geometry has a new module where the equivalent wing is based on the cranked wing mean geometric chord.
10. Wind tunnel scaling of stability & control derivatives is included in the stability and control module.
11. Multiple flap segments with different flap types can now be defined.

12. Change in wing maximum lift coefficient due to slats and Krueger flaps are now accounted for.
13. The coefficient in the wing weight equation for reference span is now 6.25 as it is in the Synthesis of Subsonic Airplane Design by Egbert Torenbeek.
14. Class I Drag Polar can now be used in trim calculations.
15. Drag trend line is no longer used to trim the aircraft. The actual drag polar is used when trimming the aircraft.
16. Trim diagrams account for trim tab deflections.
17. Leading edge high lift devices are accounted in the Wind Tunnel Drag module.
18. Trendline option no longer exists in the Flight Condition dialog.
19. Stabilizer incidence is shown in the trim diagram input parameters when the stabilizer is the trim surface.
20. Airfoil coordinate points are now stored in the project file
21. Control surfaces no longer need parent lifting surface airfoils to be defined to calculate geometric parameters.
22. There are more descriptive warning messages.
23. Cambered airfoil effects are now taken into account for the canard and horizontal tail
24. If airfoil directory is incorrect, there is a warning message.
25. Control surface geometry is now exported to AeroPack.
26. Planform parameters are checked for lifting surfaces such that only parameters pertinent to the parent planform are checked and whether the airfoils are defined or not when defining control surfaces of the parent lifting surface.
27. Definition of y_{mgc} is now consistent with vertical tail z_{mgc} definition.
28. Straight Tapered planforms now calculate parameters used in the cranked lifting surface module if the lifting surface has only one panel.
29. The change in lift caused by the high lift devices at any point on the lift curve is now shown in the lift module.
30. Trimmed Lift (T from D) now recalculates the component drag parameters for the drag polar selected in the flight condition dialog box.
31. There are now GoTo buttons for the mean geometric chord thickness ratio and leading edge radius for all lifting surfaces.
32. Elevon parameters are now included in the Recalculate All module of the Stability and Control Derivatives.

33. Class II Drag plot module selects all components that are defined when Select All is pressed. There are no more messages for spoilers and/or speed brakes if none are defined in the Configuration dialog box.
34. Class II Drag polar plot the current configuration is now labeled on the plots.
35. The laminar flow friction coefficient calculation now uses 1.328 rather than 1.33 to be more accurate.
36. The steady state lift and drag coefficients are now shown as output parameters in the Trim Diagram module.

3. Problem Fixes – AAA 3.5.1

This section lists problems found in AAA 3.5 and earlier versions, which are fixed in AAA 3.5.1.

3.1 Weight

1. Class II structure weight does not include nacelle weight if there are no pylons. If there are pylons, the pylon weight is added twice.
2. Mission Profile/Weight Sizing: Expended Payload weight is not working correctly.
3. Segment beginning fuel weight is not shown when an older AAA file is loaded.
4. There is an error message if a flight segment is inserted, but the segment type is not specified.

3.2 Aerodynamics

1. $D_{f_{max_w}}$ and w_{f_w} should be excluded from the input when wing is not attached to the fuselage.
2. The number of attached stores is to be defined before entering the Class II Total Drag Module.
3. The number of ventral fins must be defined before entering Class II Total Drag and Recalculate All.
4. The canopy or windshield must be defined before entering Class II Total Drag or Recalculate All in the Class II Drag module.
5. Nacelle drag coefficient due to lift does not have a GoTo button.

3.3 Performance

1. The maximum speed calculation will crash if P_{avail} and P_{req} curves do not intersect.

3.4 Geometry

1. Dihedral angles are summed up over multiple panels.

3.5 Propulsion

No Changes

3.6 Stability and Control

1. The calculation of $C_{n_{\delta_{rv}}}$ changes the value of $C_{y_{\delta_{rv}}}$ when calculated in the wind tunnel module.
2. $C_{l_{\delta_{rv}}}$ and $C_{n_{\delta_{rv}}}$ output parameters are not shown when calculate is pressed once.
3. The error message that pops up if the jet engine tilt angle is not defined is incorrect.
4. Trim Diagram: the incorrect angle of attack is used to calculate thrust from drag, which causes the thrust not to vary with angle of attack.
5. There is a floating point overflow error in the Trimmed Lift (T from D) module if the aircraft speed is very low (< 0.01 kts).

3.7 Dynamics

No Changes

3.8 Loads

No Changes

3.9 Structures

No Changes

3.10 Cost

No Changes

3.11 General

1. A share violation occurs if an Excel file being exported to is still open in Excel.

4. Problem Fixes – AAA 3.5

This section lists problems found in AAA 3.4 and earlier versions, which are fixed in AAA 3.5.

4.1 Weight

1. Weight sizing regression plot scales have units of lb when scale options are opened by double clicking on the axes.
2. Weight iteration table does not save data entered in the User Weight column for the horizontal tail.
3. Individual nacelle weights are not calculated to determine the total CG location of the nacelles
4. Class II Weight Iteration module does not work for Unpowered Gliders.

4.2 Aerodynamics

1. Gap effects are not accounted for elevons.
2. Trailing edge flap drag is not calculated if only drooped ailerons are defined.
3. Horizontal and vertical tail downwash gradients are the same with flaps down and flaps up for non-plain flaps.
4. $\Delta C_{m_{w_{LE}}}$ is incorrect when slats and Krueger flaps are defined together.
5. AAA no longer limits the number of pylons to 10 in the analysis.
6. The GoTo button for the vertical tail wetted area causes an access violation error.
7. $C_{y_{v_\beta}}$ is not calculated if vertical tail is not attached to fuselage and all input parameters are filled in.
8. The calculation of $C_{L_{vee_\alpha}}$ does not match the formula in the theory.
9. Trimmed drag polar only accounts for induced drag and does not take into account the profile drag due to trim surface deflections.
10. Vertical tail drag uses canard critical Mach number instead of vertical tail critical Mach number in the Class II transonic Vertical Tail module.
11. In the Canopy Drag Module the angle of attack should be an input not the lift coefficient.
12. There is a discrepancy between the trimmed drag polar and the Class II trimmed drag build up module.
13. The canopy drag logged in by Trimmed Lift T from D does not match the value calculated by the drag module.

14. Nacelle drag is calculated incorrectly for aircraft with two or more nacelles under the wing. This produces different results for each nacelle whereas mirrored nacelles about the center line should have the same drag coefficient.
15. The location of the nacelle relative to the wing is not always determined correctly for downwash and upwash calculations. This is caused by a radian to degree conversion error in the leading edge sweep angle of the wing.
16. Elevon nose shape is checked on entering Airplane Lift due to elevon deflection derivative module, but not checked if using the GoTO button from the Wing Linear Lift module
17. Class II drag will let the user enter in the landing gear drag module without prompts for landing gear type (main, nose, tail or outrigger).
18. The number of sideslip angles in the non-linear C_{y_v} does not have the up/down arrows on the input selection.
19. Drag from Trimmed Lift T from D now matches the calculated total drag value for all configurations.
20. Elevon gap parameters do not affect output parameters for $C_{L_{w_\alpha}}$.
21. Class II Fuselage drag is incorrect for fuselages with large slenderness ratios.
22. The apparent mass factor becomes very large for large fuselage fineness ratios.

4.3 Performance

1. Performance sizing max cruise speed calculation and matching plot should use propeller efficiency.

4.4 Geometry

1. Straight tapered methods are missing for a V-tail configuration.
2. On a new file, fuselage geometry gives an warning about not all data being defined even when all data is defined.
3. In fuselage geometry, if the last section is the largest cross section and error message is shown saying the table is incorrect.
4. The fuselage cross sections are not centered about the Y-axis in the cross section display window.
5. The body cross sectional areas are slightly incorrect if the conic farthest from the Z-axis has a rho value greater than 0.98.
6. The program checks for operating engines when plotting the airplane 3-view.

7. Nacelles, tailbooms, floats and stores are defined by projected angles.
8. Airplane 3-view will now plot fuselage if no lifting surface data is defined.
9. Vertical Tail geometry parameters are not calculated correctly
10. Floating point error occurs if the Y-location of the last panel's root is on the lifting surface tip.
11. There are no checks in the software to see if a lifting surface is forward of the fuselage nose if attached to the fuselage.
12. Vertical Tail geometry parameters are not calculated correctly if the Z-location of the apex is not zero.
13. There are no methods implemented for the width of the fuselage in the region of the lifting surfaces but the variables are shown as output variables.
14. Scaling function does not scale aircraft bodies properly
15. Scaling function does not scale pylons properly
16. Scaling function does not scale landing gear
17. Scaling function does not scale propeller
18. Passenger Center of Gravity data does not scale when using the scaling function
19. Control surfaces are not scaled in the AeroPack Export.
20. The number of passengers in the weight sizing needs to be a separate variable from the one in Class II Weights
21. AeroPack export of the Spoiler does not position the spoiler correctly in the chordwise direction.
22. AAA does not check if a canopy is defined in the configuration dialog box before allowing the user access to the canopy geometry module.
23. AeroPack export for bodies does not use apex location when coordinates are defined in Airplane coordinate system and sets the apex to the origin resulting in an incorrect representation of the body geometry.
24. Airfoils for the vertical tail are connecting the wrong points of the airfoil coordinates in the airplane three-view top view.
25. Airfoils for the V-tail are not perpendicular to the V-tail surface plane.
26. Pylon airfoils exported to AeroPack are exported upside down.
27. Lifting surface airfoils do not have the correct chord length in the side view of the Three-view. It is not based on projected chord lengths.
28. The inboard line of the port side lifting surface is not draw in the three-view if the lifting surface has a Y-offset.
29. Pylon sweep, incidence and dihedral should be based on pylon coordinate system.

4.5 Propulsion

1. The GoTo button for the take off thrust should not be there as the take-off thrust is not calculated by AAA.

4.6 Stability and Control

1. C_{m_q} module shows f_{gap} only for ailerons and not for elevons.
2. C_{y_p} module button click does not ask for aileron or elevon defined.
3. C_{y_p} module shows f_{gap} as an input even if no ailerons are defined.
4. C_{l_p} module shows f_{gap} as an input even if no ailerons are defined.
5. $C_{l_{\beta_{vee}}}$ and C_{l_β} are not calculated for a V-tail configuration if data is entered from scratch in the C_{l_β} window.
6. Not all output is calculated in the C_{m_u} module even when all data is entered from scratch in the C_{m_u} window.
7. The labels on the α lines are incorrect in the Trim Diagram causing a floating point problem.
8. w_{f_h} is shown as an input in the C_{m_α} module even though it is indicated that the horizontal tail is not attached to the fuselage.
9. There is a floating point error in the wing location module if the wing travels aft of the vertical tail.
10. Defined data checks are not correct for aircraft with elevons in the Trimmed Lift (T from D) module.
11. All sidewash-related derivatives are removed from the Sideslip Rate module if there is no vertical tail or V-tail.
12. Stick Free Static Margin does not get calculated if there are no elevators or ruddervators

4.7 Dynamics

No Changes

4.8 Loads

No Changes

4.9 Structures

No Changes

4.10 Cost

No Changes

4.11 General

1. The number of decimals in the legend now matches the variable output window
2. Flight condition data entered in the flight condition dialog box does not update unless "OK" is selected and data will be lost if the user switches to a different flight condition without selecting "OK."
3. The $C_{L_{max}}$ submenu appears over the downwash submenu.
4. Integer Variables with an increment arrows do not have working Help and Notepad buttons.
5. Elevon is not saved as a trim surface in the Flight Condition dialog window.
6. Windshield is spelled incorrectly in the transonic/supersonic speed regime warning message in Class II Drag
7. Spin Element should not be editable.
8. Work pad does not transfer the input value if the work pad is opened using the same cell.
9. The variable edit of a locked parameter turns white after clear out is press and does not turn grey again until the wrench is clicked.
10. V-tail geometry sub-modules are still shown when the AeroPack module is accessed.