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Interactive comment on "Parametric slat design study for thick base airfoils at high Reynolds numbers" *by* Julia Steiner et al.

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General remarks

Dear referee,
we appreciate that you took the time to read the paper and give useful feedback that helped us improve the paper. Replies to your remarks follow.

The paper deals with the slat design for thick base profiles at high Reynolds numbers. Due to various combinations of presented cases it is hard to follow the intended logic in the structure. There are too many different cases which are compared back and forth

with references to the appendices. The authors should try to better structure the cases and results. After reading the paper I have a hard time to really summarise it for me with a take home message.

Clarifications in the text have been added to make it more clear. Additionally, some figures and tables have been moved from the appendix into the main text to make easier to understand.

Reply to specific comments
Page 5: *In the shape parametrisation it is written that the leading edge location was fixed to the coordinate system (0,0). Since slat and base profile combined are subject to optimisation it is not clear which leading edge is fixed to (0,0).*
The leading edge of the main element was meant. The text has been modified to clarify this.

Page 6: *The optimisation objectives are formulated as a weighted sum of the performance under clean and rough conditions. What do the authors mean by rough conditions and how do they define it?*
Clean conditions are the conditions where the flow naturally transitions to a turbulence boundary layer. We specify a specific turbulence intensity in the inflow in case of CFD or a specific ampliciation factor in case of MSES which then relates to the transition location. For rough conditions, there is some difference between the results from CFD and MSES. In Mses we specify a specific position on both slat and main element where a transition to a turbulence boundary layer is forced. In CFD, the boundary is assumed to be fully turbulent so there is no transition. Clarification was added to text on page 6.

Page 6: *In eq. 5 and 6 the weighting terms have the index "clean / tripped". So far it is not clear what that means. The authors should give more details on the tripping they*

applied in their simulations. Also, is only the main profile tripped or also the slat?
Clarification was added in the text on pages 6 and 7. Both main and slat element are tripped.

Page 8/9: *The authors try to validate their fluid models against different benchmark cases. In the first one they use MSES and CFD and in the second one they use only CFD. They argue that they can use the lower fidelity model for their optimisation procedure as this is only based on the first benchmark. On the contrary, the authors say that the simple model has problems to converge due to the sharp edges in the geometry. This is a limiting factor in their procedure. So why do the authors also show the second benchmark that does not contribute to their decision?*
MSES has been used in literature on cases with sharp edges, but we could not make it work. That is why it was left out. The second benchmark case is used to show that the CFD model can yield accurate drag predictions, because there are issues with this for the first benchmark case. This helps validate our hypothesis that there are issue with the drag measurements for the first benchmark case.

Page 10: *In figure 6 the results for clean and rough are plotted. Again, it is not clear what "rough" refers to and how it is defined.*
This should be clear now, since clarification was added on pages 6 and 7. Also see the previous replies.

Page 11, Figure 7: *The caption of the Figure is insufficient, what are e.g. the different lines (dotted,dashed and solid) of the slat?*
The legend has been extended.

Page 12, Figure 8: *What is Lmax, Interm and Gmax? What is the "integral design"?*

The integral designs are obtained in an optimization procedure where both the slat and the main element are optimized simulataneously. A remark has been added in the text to say that the results of the integral design procedure are not relevant yet at this point in the text. Lmax, Interm and Gmax refer to the location of the designs on the pareto front as shown in the previous. This figure has been moved from the appendix to the main text, to make it more clear.

Page 13: *Third bullet point: Where is the influence of the base profile thickness discussed?*
It says in the text with respect to the slat design, "The change in the base profile thickness introduces smaller design deviations from the baseline case as compared to the chord and gap width reduction. This goes back to the argument that the strongest design driver for the slat element is the location of the suction peak on the main element."

Page 13: Figure 9: *Again, in the caption is stated "rough" and "tripped" without any further description.*
This has been explained in previous replies.

Page 14: *Second sentence: What do the authors refer to by stating " Hence, the profiles optimized for maximum lift actually perform worse in terms of maximum lift as compared to the ones optimized for maximum glide ratio" ? Where can this be seenin figure 9? Which is the design for lift optimisation and which is the one for maximum glide ratio?*
The legend of Figure 9 has been extended to clarfiy a bit more. What the figure shows is that MSES overpredicts the stall angle and hence the maximum lift as compared to CFD for the cases where we optimized for maximum lift. For the profiles optimized for maximum glide ratio, MSES and CFD predict similar stall angles. Hence, these

designs actually yield higher lift.

Page 15, Figure 11 : *insufficient caption.*
The caption has been modified.

Page 17, Figure 13: *What are the differences on the plots? Even the text doesn't help.*
The figure shows the designs resulting from the auxiliary and integral design procedure given the different optimization boundary conditions.

Reply to technical comments
There were only minor remarks and they have been corrected.

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