Main Conclusions :

- Participants have used different numerical techniques that cover a wide range of methods for computing the solutions of the two test cases considered. Nevertheless, the quantities under consideration for this workshop computed by the participants are close to each other (there is not a lot of dispersion in the data). It is of particular interest since it shows that a good agreement in the solutions can be obtained even though very different methodologies are used. This encouraging result is partially due to the fact that all the grids and definitions of the boundary conditions were given.

- In the framework of V&V, the recommended procedures are based on grid refinement studies along with Richardson extrapolation. Successes, difficulties and failures of such methodologies have already been pointed out. But, these previous results are once again valid for the present data. In term of error estimation, the two main difficulties regarding Richardson Extrapolation are the following :

  - the scatter in the data that has different origins (lack of grid similarity, switches in turbulence models, limiters in numerical schemes, ...).
  - The oscillatory behaviour of the grid convergence. In fact, no solution has been found yet for curing this difficulty.

- However, applying safety factors on the estimated error from Richardson extrapolation as proposed by Roache (Grid Convergence Index) permits to compute reliable error bars. And, the Least Squares Approach permits to reduce the influence of the scatter in the data (but not completely). As a matter of fact, five of the six participants that have used the GCI have also considered the Least Squares Approach. The overlap of the error bars calculated and presented in the proceeding are encouraging but not fully satisfactory since the overlap is not true for all the considered quantities.

- The only criticism is that all the participants (except us but we have performed error estimations and not derived error bars) have solely used the GCI for computing error bars. It would have been interesting to test also alternative techniques.

Suggestions for future workshops :

- The considered test cases should be derived using the Method of the Manufactured Solution in order to know the exact solution and thus the exact discretization error. Doing so, more precise conclusions could be drawn.

- The computational grids should be constructed by each participant and no particular constraints should be applied to them, especially regarding the grids similarity, as it is the case when considering practical problems. But, as it was done for this workshop, the inlet conditions (i.e. the no obvious Dirichlet Boundary Conditions) should be given in order that all the participants treat the same mathematical problem. Using the MMS this point is naturally adressed.

- Unstructured grids should also be taken into consideration as they are more and more used by the CFD community and some particular difficulties may arise considering such grids.