Propositions

accompanying the dissertation

LARGE EDDY SIMULATION OF HYDROGEN COMBUSTION

DEVELOPMENT OF MODELS AND APPLICATIONS FOR SUSTAINABLE POWER GENERATION

by

Gioele FERRANTE

1. Under moderate stratification and globally lean conditions, differential diffusion remains significant even in the presence of turbulence. In contrast, in highly stratified turbulent combustion, turbulent transport dominates and differential diffusion becomes negligible. *("This proposition pertains to this dissertation")*
2. Large eddy simulations (LES) provide valuable insight into the physics of the combustion process within a practical combustor even when results do not fully match experimental measurements. *("This proposition pertains to this dissertation")*
3. The development and validation of LES models necessitate the use of data from Direct Numerical Simulation (DNS). Comparison with experimental datasets serves as a subsequent complementary step in the validation process.
4. While academic engineering research is often seen as an individual effort, the transfer of knowledge within a research group is just as crucial as in industrial development for surpassing the state of art.
5. Every transport process in fluid dynamics is laminar, turbulence is a macroscopic observational framework deriving from a limited resolution capability (of our measurement method, mathematical or mental model). In turn, both laminar and turbulent transport only exist inherently within the “continuum fluid” assumption.
6. Content is more important than packaging, especially when deadlines are near. However, poor form undermines the credibility of the content.
7. Self-confidence does not necessarily reflect a full understanding of a subject, yet in our society it is often valued more than thoughtful caution, comprehensive critical thinking and doubt, often perceived instead as hesitation or indecisiveness.
8. The increasing level of specialization required by the job market limits the immense interdisciplinary potential intrinsic to human creativity.
9. If effort is a vector quantity (cit. Prof.dr. A. Gangoli Rao) and we can define an "effort vector field" $\vec{E}$, then a positive effort divergence $\nabla \cdot \vec{E} > 0$ is beneficial in the initial exploratory phase of a research project, while a divergence-free effort field $\nabla \cdot \vec{E} = 0$ is essential for successfully achieving research goals.
10. Life-threatening activities are an effective method to reframe everyday problems and to relieve stress from a sedentary job.

These propositions are regarded as opposable and defendable, and have been approved as such by the promotors Prof.dr. A. Gangoli Rao, Prof. Dr.-Ing. G. Eitelberg, and the copromotor Dr. I. Langella.