

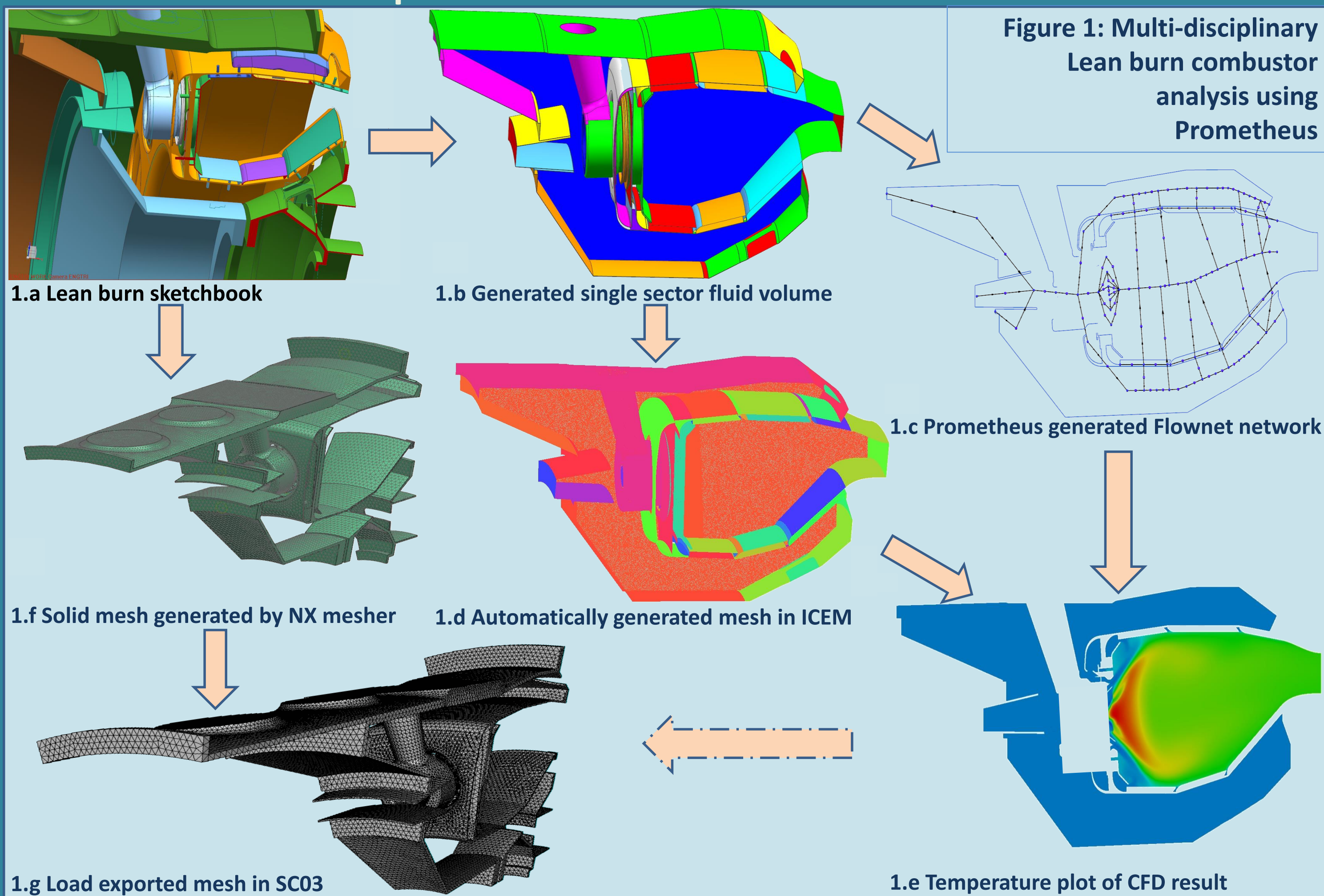
# Prometheus: Embedding Knowledge & Best Practice Within CAD for Combustor Design Optimisation

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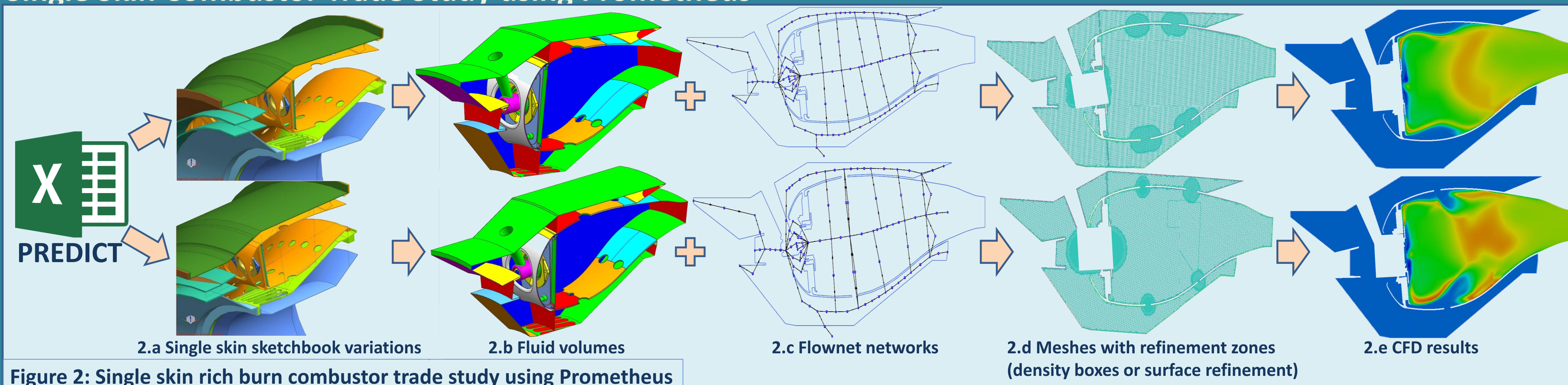
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## Prometheus Latest Capabilities for Lean Burn Combustor



After successfully applying the Prometheus system to various rich burn combustor designs its capabilities have now been extended further to deal with lean burn combustors. As illustrated in Figure 1, starting from a lean burn sketchbook (1.a) Prometheus extracts the fluid volume for single sector (1.b). The Flownet network (1.c) is then generated for aero-thermal analysis and to populate boundary conditions for Computational Fluid Dynamics (CFD) simulation. An appropriate meshing script is generated as well. This is then used by Ansys ICEM to create the corresponding mesh (1.d), which can be used for CFD simulation either in Precise-UNS or Ansys Fluent. A script to automate CFD simulation (1.e) is simultaneously generated with the Flownet network and meshing script. Moreover, Prometheus can now generate a 10 node tetrahedral 3D solid mesh using the Siemens NX mesher (1.f) and export the mesh as a PM file to SC03 for using in a subsequent thermo-mechanical simulation (1.g). Work is currently ongoing to map the CFD results to SC03 simulation. (In this poster the injectors were blocked on purpose)

## Single Skin Combustor Trade Study using Prometheus



Recently Prometheus has been used to perform a single skin rich burn combustor trade study. The study has currently performed hundreds of Precise simulations using Prometheus to investigate different length-depth ratios, numbers of injectors, porting arrangements and air-fuel ratios. As part of this study a version of the Rolls-Royce PREliminary Design Combustion Toolset (PREDICT) is run to define cycle information as well as effusion settings etc. The CFD fluid volume for a fully parameterised combustor sketchbook (2.a) is loaded by Prometheus and the corresponding fluid volume extracted (2.b). The PreDiCT file is then parsed by Prometheus with the relevant inputs used to populate the nodes of some automatically generated Flownet model (2.c). As with the lean burn simulations a script to perform the meshing in ICEM and a PRECISE-UNS simulation script are automatically generated with the PRECISE script employing boundary conditions automatically extracted from the Flownet simulation.

## Acknowledgements

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