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STS

Drag Reduction for Transport Aircraft

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Both the United Nations climate conference of Paris in December 2015 and Europe's Vision for Aviation 'Flightpath 2050' sets have set a target of 75% reduction of specific fuel consumption by 2050, compared to the standard for civil aviation in 2000. To achieve this ambitious goal, we need to work on three topics: improvement of engine efficiency, reduction of the aircraft weight, and aerodynamic drag reduction.

In this session, we cover some aspects of the last topic, the reduction of aerodynamic drag. The latter consists of two main components: lift-independent (friction or viscous) drag and lift-dependent or induced drag [1]. Both drag components will be addressed in the session.

Regarding friction drag reduction, we present new developments of the application of natural laminar flow. We will consider forward-swept wings, which make it easier to keep the attachment line laminar. Furthermore, we take a look at a backward-swept, laminar wing with a reduced chord which is complemented by a larger span. This approach combines two advantages. The smaller chord-Reynolds number makes it easier to achieve and maintain laminar flow, and the increased span reduces the induced drag.

Then we will present the latest results of Clean Aviation [2, 3] regarding hybrid laminar flow control applied to wing and horizontal tail plane.

In the second part of the session, we address new structural concepts combined with advanced load alleviation, which have a great potential to allow for a lighter wing with increased span, and, thus, reduce lift-dependant drag [4]. A fuel burn reduction of 30 % compared to the state-of-the-art reference Aircraft A321neo is expected.

References:

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