



NORTH ATLANTIC TREATY ORGANIZATION

**SCIENCE AND
TECHNOLOGY
ORGANIZATION**



LECTURE SERIES SCI-277

on

**“Store Separation and Trajectory Prediction”
(Séparation de charges et prédiction de
trajectoire)**

Co-organized by the

Systems Concepts and Integration (SCI) Panel

&

**Von Karman Institute of Fluid Dynamics
Brussels 1-2-3 June 2021**



The event will be held virtually (on-line).

**This Lecture Series is open to citizens
from NATO Nations,
Australia, Finland and Sweden.**

**Latest registration date:
1 week prior to the event**

Enroll on-line at <https://events.sto.nato.int/>

**All presentations and discussions will be held in
English**

Background

The mission of STO is to conduct and promote co-operative research and information exchange. STO consists of a three level organization: the Science and Technology Board (STB), the Panels and the Technical Teams. The Systems Concepts and Integration (SCI) Panel is one of the seven Panels under the STB.

The mission of the Systems Concepts and Integration (SCI) Panel is to advance knowledge concerning advanced systems, concepts, integration, engineering techniques and technologies across the spectrum of platforms and operating environments to assure cost-effective mission area capabilities.

Theme

Store separation is the process that any new aircraft/weapon combination has to undergo before a flight clearance is issued. This can be done using previous data for existing aircraft and weapons. New aircraft and/or weapons (both internal and external) require extensive CFD, wind tunnel, ground and flight testing.

The store separation process consists of five distinct disciplines conducted by independent groups: aircraft performance, flying qualities, structures, flutter and store release. Prior to store release from the aircraft, each selected aircraft/weapon combination has to undergo extensive aerodynamic and structural analyses and testing. This may take many years to complete. The Joint Strike Fighter (JFS) operational deployment occurred almost ten years after its first flight.

One goal of the lecture series is to bring together individuals that may be working in several independent disciplines and discuss/consider ways the store separation process might be improved. The lecture series will discuss whether aerodynamic, structural and store release flight testing can be combined.

Topics to be covered:

The topics to be covered during the lecture series will include the following topics but will not be limited to:
Wind Tunnel testing including freestream (Mach, PSI, THE, PHI, appropriate scale), grid (Mach, X, Y, Z, PSI, THE, PHI), Mach Sweep, CTS trajectories, Drop testing, bomb bays. The lectures will cover a broad spectrum of subjects including both experimental and computational aspects of store separation related to its aerodynamics, performance and flying qualities, structures, stability and control as well as flutter and dynamical problems.

Thème

Toute combinaison entre un nouvel aéronef et/ou une nouvelle arme doit suivre une analyse du processus de séparation de charges avant que l'autorisation de vol soit donnée. Cela peut être réalisé à l'aide de données antérieures sur les aéronefs et les armes existantes. Les nouveaux aéronefs et / ou armes (à la fois internes et externes) imposent une DFC approfondie, des essais complets en soufflerie aérodynamique, ainsi qu'à terre et en vol.

Le processus de séparation de charges intéresse cinq disciplines distinctes confiées à des groupes indépendants : performances de l'aéronef, qualités de vol, structures, flottement et séparation proprement dite. Avant le largage, chaque combinaison aéronef-arme doit subir des analyses et des essais aérodynamiques et structurels complets, qui peuvent demander plusieurs années. Le déploiement opérationnel du *Joint Strike Fighter* (JSF) a eu lieu presque dix ans après son premier vol.

L'un des objectifs de la série de conférences est de réunir des personnes qui travaillent dans plusieurs disciplines indépendantes pour qu'elles discutent et étudient comment améliorer le processus de séparation de charges. Cette série de conférences discutera en particulier de la possibilité ou non de combiner des essais en vol aérodynamiques, structurels et de séparation de charges.

Sujets traités

Les sujets traités pendant la série de conférences seront notamment les suivants :
Essais en soufflerie aérodynamique incluant l'écoulement libre (Mach, PSI, THE, PHI, échelle appropriée), la grille (Mach, X, Y, Z, PSI, THE, PHI), le balayage du nombre de Mach, les trajectoires CTS, les essais de largage et la soute à bombes. Les présentations couvriront un large éventail de sujets comprenant les aspects numériques et expérimentaux de la séparation de charges relatifs à son aérodynamisme, sa performance et ses qualités de vol, la stabilité et le contrôle ainsi que le comportement dynamique et les battements de l'aile pendant la séparation de charges.

Lecture Series Director

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Lecturers

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SCI-277 RLS - PROGRAMME

DAY ONE – June 1 2021 from 13:30 to 17:30 CET

- 13:30 Opening Ceremony & STO Overview
Dr. Nafiz Alemdaroglu & Dr. Bayindir H. Saracoglu
- 14:00 Effects of Stores on Aircraft Performance
Dr. Joseph Nichols (presented by Dr. Alex Cenke)
- 15:00 Coffee Break
- 15:30 Effects of Stores on Flying Qualities
Dr. Joseph Nichols (presented by Dr. Wolfgang Luber)
- 16:30 Effects of Stores on Aircraft Structures
Dr. Wolfgang Luber
- 17:30 Discussion - end of day 1

DAY TWO – June 2 2021 from 13:30 to 17:30 CET

- 13:30 Store Separation Overview
Dr. Alex Cenke
- 14:30 CFD Applications to Store Separation
Dr. Nafiz Alemdaroglu
- 15:30 Coffee Break
- 16:00 Structural Dynamics and Flutter
Dr Wolfgang Luber
- 17:30 Discussion - End of Day 2

DAY THREE – June 3 2021 from 13:30 to 17:30 CET

- 13:30 CFD Use and Applications to Store Separation and Store Compatibility with Aircraft
Dr. Bruce Jolly
- 14:30 Examples of Structural Dynamic and Flutter Testing
Dr Wolfgang Luber
- 15:30 **Coffee Break**
- 16:00 CFD Challenges and Future Plans in Application with Store Separation
Dr. Bruce Jolly
- 17:00 Improvements in Aircraft/Weapon Integration
Dr. Alemdaroglu, Dr. Cenke, Dr. Luber, Dr. Jolly
- 17:30 Closing Remarks end of lecture series
Prof. Dr Nafiz Alemdaroglu and & Dr. Bayindir H. Saracoglu

HOW TO ENROLL

LECTURE SERIES SCI-277 in 2021

1-2-3 June 2021

This Lecture Series will be performed on line

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Latest registration date: 1 week prior event

Enrollment must be made via internet only at

<https://events.sto.nato.int/>

Note: If this is the first time you use the Events Management System you will need to create an account by clicking on 'Create an account' under the Log in blue button. Then follow the instructions and create your profile. Please note that participants are to make their own travel arrangements and hotel bookings.

If you are unable to enrol via the internet, please contact lectureseries@cs0.nato.int

Contact/Enrolment Coordinator

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