

# Focus on CSIR services in weapons integration



The SAAF and Armscor has invested for decades into developing a world-class centre of excellence in weapons integration at the CSIR

The CSIR focuses on evaluating the aero/mechanical impact of integrating the store onto the aircraft. This work is done in compliance with MIL-HDBK 1763 and covers the following aspects:

- Aeroelastic (flutter) compatibility
- Store separation behaviour/safety
- Loads on aircraft during carriage
- Impact on aircraft performance/handling characteristics

## Aeroelastic (flutter) compatibility

Flutter is very dangerous dynamic instability that all aircraft can encounter.

- Flutter is driven by the mass and stiffness distribution in the aircraft structure, combined with its aerodynamic characteristics
  - Changes to those characteristics due to the addition of a new store can cause flutter.
- It is essential that the aeroelastic properties of all new aircraft store configurations are evaluated to ensure that flutter does not occur.

The CSIR is a leader in aeroelasticity technology and has cleared almost 200 aircraft configurations for the SAAF since the 1970's. It has a full range of aeroelasticity capabilities including:

- Ground vibration testing (GVT) and modal analysis
- Finite element modelling (FEM)
- Unsteady aerodynamics analysis
- Flutter analysis
- Flutter flight test tools and excitors

## Store separation analyses

The importance of store separation analysis cannot be underestimated since stores that are individually stable can

behave VERY differently in the flowfield of an aircraft. This can result in unexpected dynamics with the store possibly colliding with the aircraft. It is essential to verify that stores can be released safely over full release and jettison envelopes.

Store separation analyses are very complex and require the use of advanced computational and experimental tools. These include:

- ARUV panel code
- CCM+ and CFD-Fastran computational fluid dynamics codes
- The Medium Speed Wind-Tunnel fitted with the captive trajectory system
- The AnalyseEjection code system

The CSIR has developed store separation analysis tools in-house and has led the field in South Africa since the 1970's.

### Carriage loads analysis

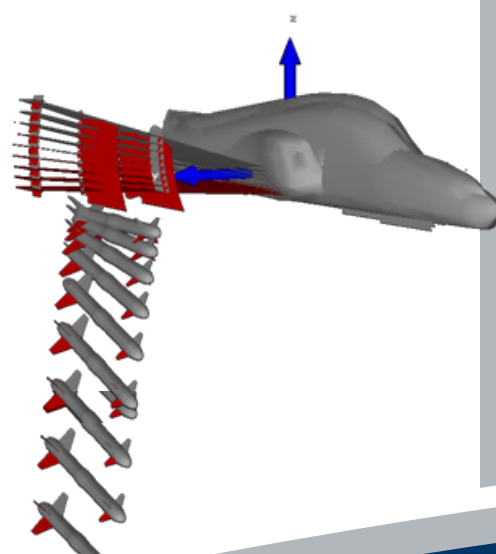
Stores exert loads on the aircraft structure while it is being carried. These loads include:

- Aerodynamic
- Manoeuvre
- Landing
- Ejection

It is important to ensure that aircraft structure is not overstressed at any point. The CSIR performs analyses in compliance with the applicable regulations using a range of aerodynamic, simulation and dynamics tools.

### Performance and handling analysis

The addition of the store affects the performance and handling of the aircraft. It is important to compare the actual performance envelopes against the specifications for the configurations with the store. It is also necessary to ensure that the aircraft is controllable and has acceptable handling in all phases of flight. The CSIR performs analyses in compliance with applicable regulations.



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