Loads

- **LE3 - Loads Models**

Loads

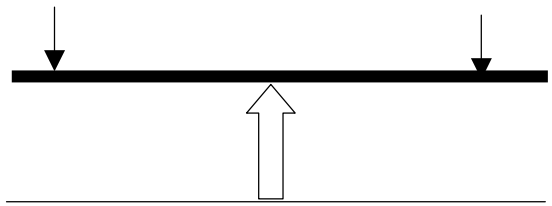
- **LE3 - Loads Models:**
  - "Rigid" Airplane:
    - The airplane is considered as a rigid body (no structural flexibility)
    - The aircraft movement is longitudinal (2 degrees of freedom: vertical and pitch), or lateral (3 degrees of freedom: lateral, roll & yaw)) or a full 6 degrees of freedom around the 3 axes of movement X, Y, Z
  - Flexible Airplane:
    - Large transport airplanes are not rigid, their structure is flexible.
    - If deflections under load would significantly change the distribution of external loads, this redistribution must be taken into account (FAR25 § 301 (c)).
    - The following models applied:
      - "Quasi-Flexible" Airplane:
      - "Fully-Flexible" Airplane

Loads

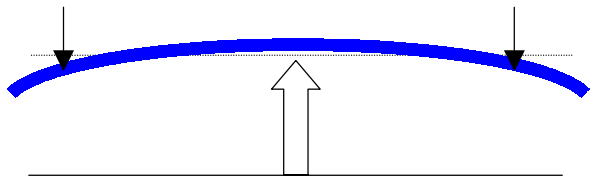
- **Loads Models:**
  - Flexible Airplane (cont'd):
    - "Quasi-Flexible" Airplane:
      - The airplane is considered as a flexible body which deforms **statically**. Consequences of these deformations are taken into account on aerodynamic forces (redistribution as results of the structural static deformation).
      - Airplane movement representation as for rigid airplane (2 or 3 or 6 degrees of freedom).
    - "Full Flexible" Airplane:
      - The airplane is considered as a flexible body which deforms **dynamically.**
      - Airplane movement defined by a large number of degrees of freedom representing the rigid body modes (previous 2,3 or6 degrees of freedom) and the dynamic normal modes of the structure (the deformation associated to the resonance frequencies of the flexible dynamic structure).
      - Dynamic deformations develop unstationary aerodynamic forces (time delay between the movement and the development of the associated aerodynamic forces due to the high speed of the deformations) and additional inertia forces (due to local acceleration).

Loads

- **Loads Models (cont'd)**
  - The different models could be represented as follow (principle):
    - Rigid airplane
      - . Rigid displacement



    - "Quasi Flexible" airplane
      - . + Static deformation



    - "Full Flexible" airplane
      - . + Dynamic deformation