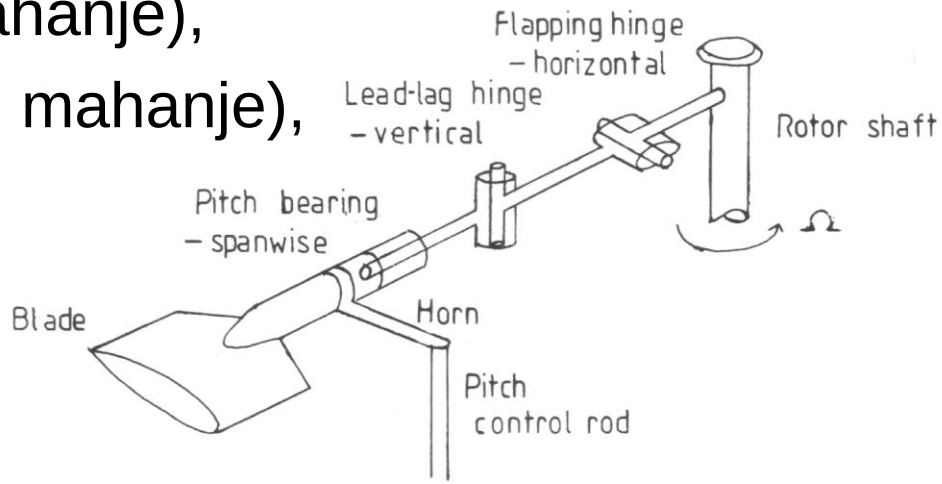
HELIKOPTERSKE KONSTRUKCIJE
IN
SPOZNAVANJE TIPOV HELIKOPTERJEV

ROTORJI

Primož Škufca

Vrste rotorjev

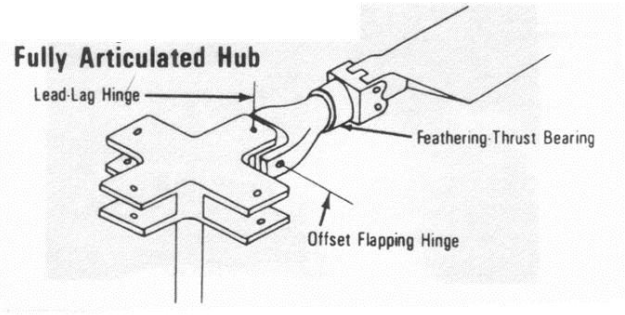
- Tri prostostne stopnje ⇔ členki, elastični elementi :
  - Flapping (vertikalno mahanje),
  - Lead-Lag (horizontalno mahanje),
  - Feathering (korak)



- Ločimo glave s:
  - 3 členi (fully articulated hub),
  - 2 ali 1 člen (semi articulated hub),
  - Elastične glave (elastomeric hub),
  - Nagibne glave (teetering hub)

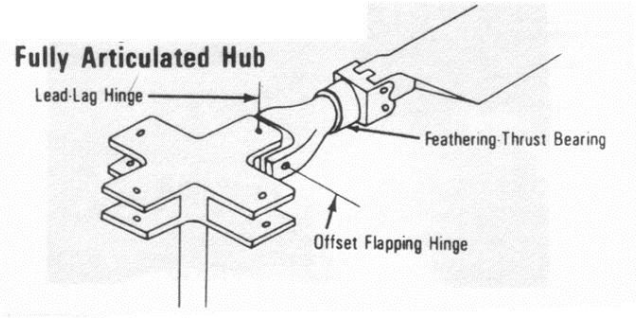
Fully Articulated Hub 1/2

Tri prostostne stopnje ⇔ trije členki



Fully Articulated Hub 2/2

Tri prostostne stopnje ⇔ trije členki

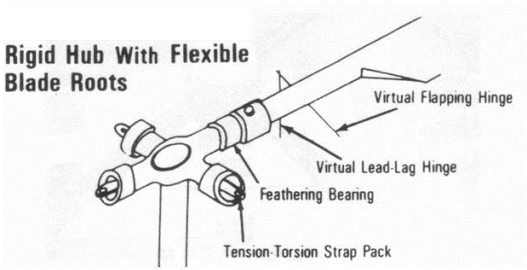


Semi Articulated Hub 1/3

Tri prostostne stopnje ⇔ 2 členka + 1 elastični člen

Semi Articulated Hub 2/3

Tri prostostne stopnje ⇔ 1 členek + 2 elastična členka



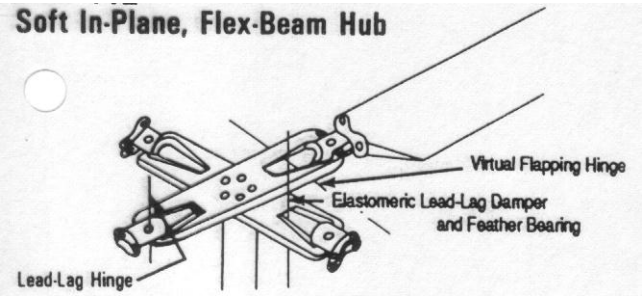
Semi Articulated Hub 3/3

Tri prostostne stopnje ⇔ 1 členek + 2 elastična členka

Spheriflex main rotor

Fleksible Hub 1/2

Tri prostostne stopnje ⇔ 3 elastični členki

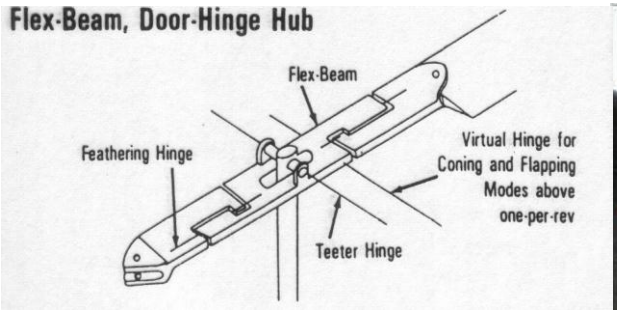


Flex-beam soft-in-plane main rotor with elastomeric bearings and dampers

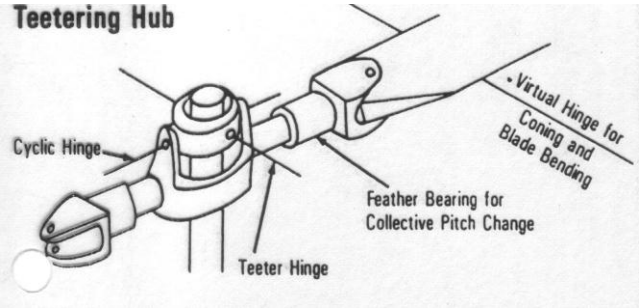
Fleksible Hub 2/2

Tri prostostne stopnje ⇔ 3 elastični členki

Teeteling Hub 1/2

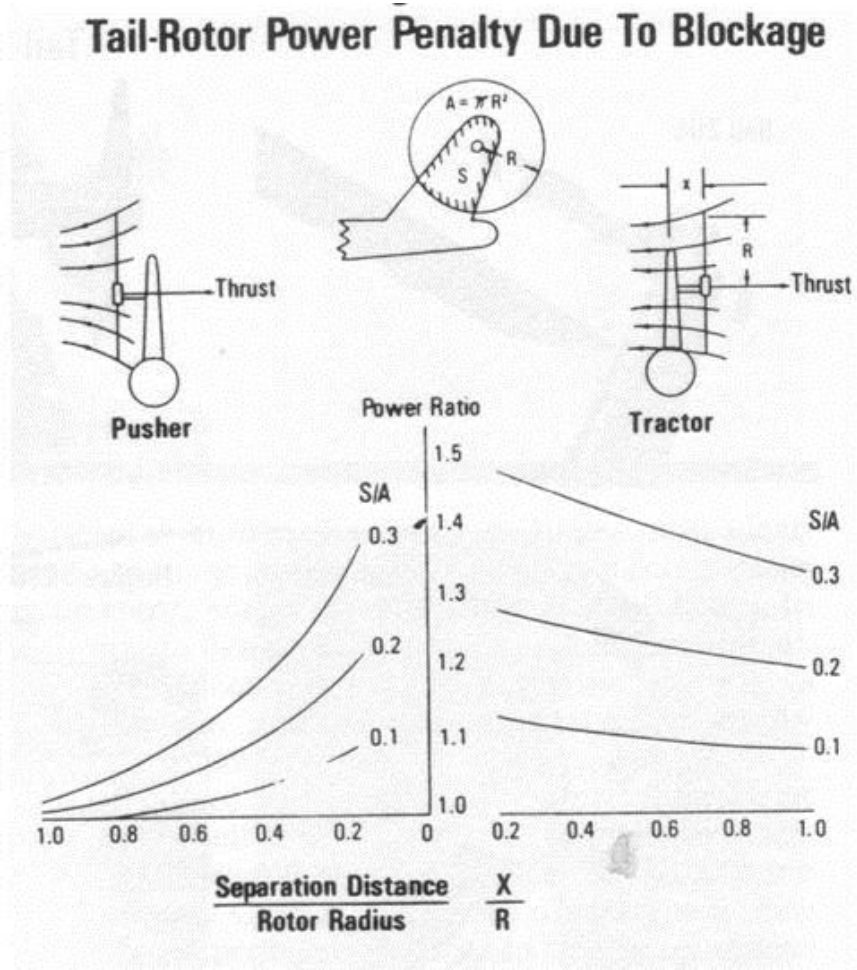


Teeteling Hub 2/2



Vrste stabilizacijskih naprav – Rotorji 1/2

- Potisni, tlačni:
  - fully articulated,
  - semi articulated,
  - elastomeric,
  - teetering hub



Vrste stabilizacijskih naprav – Rotorji 2/2

Dubble Teetering 35º/145º

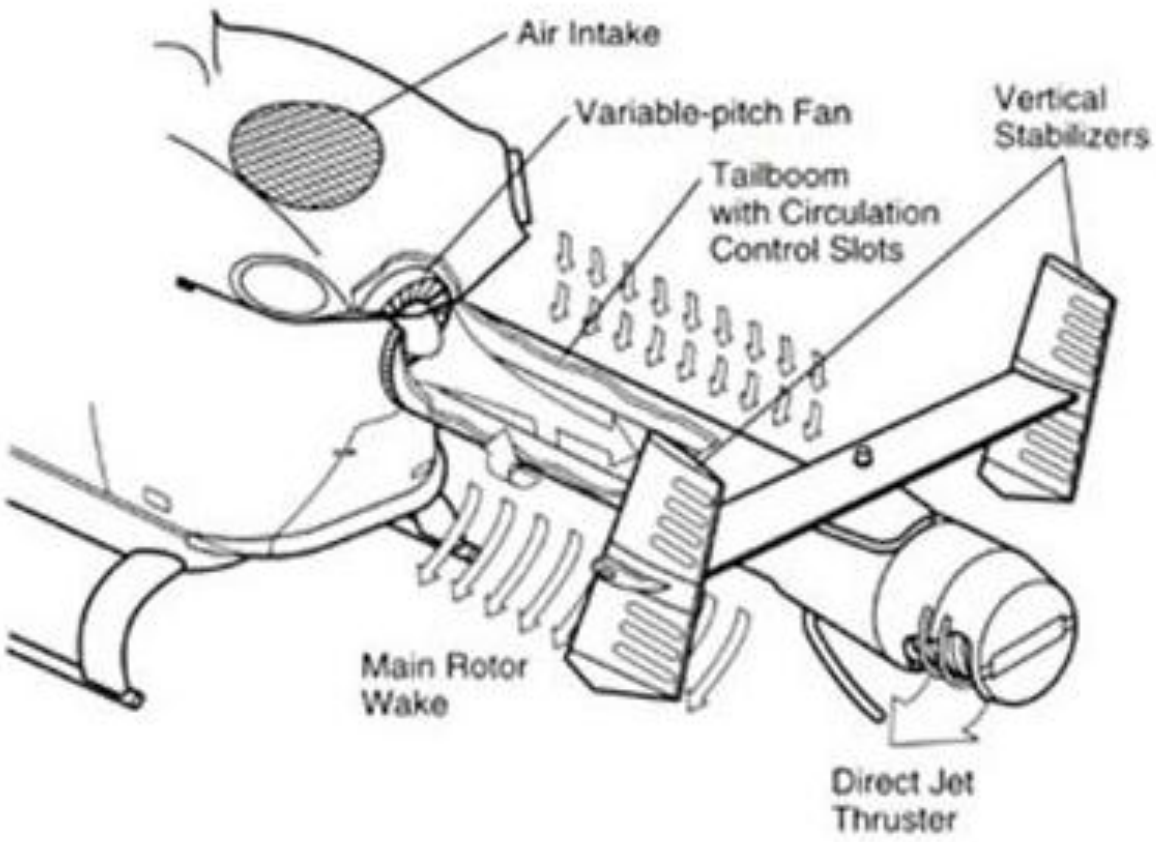
Elastometric

Semi articulated - flapping hinges only

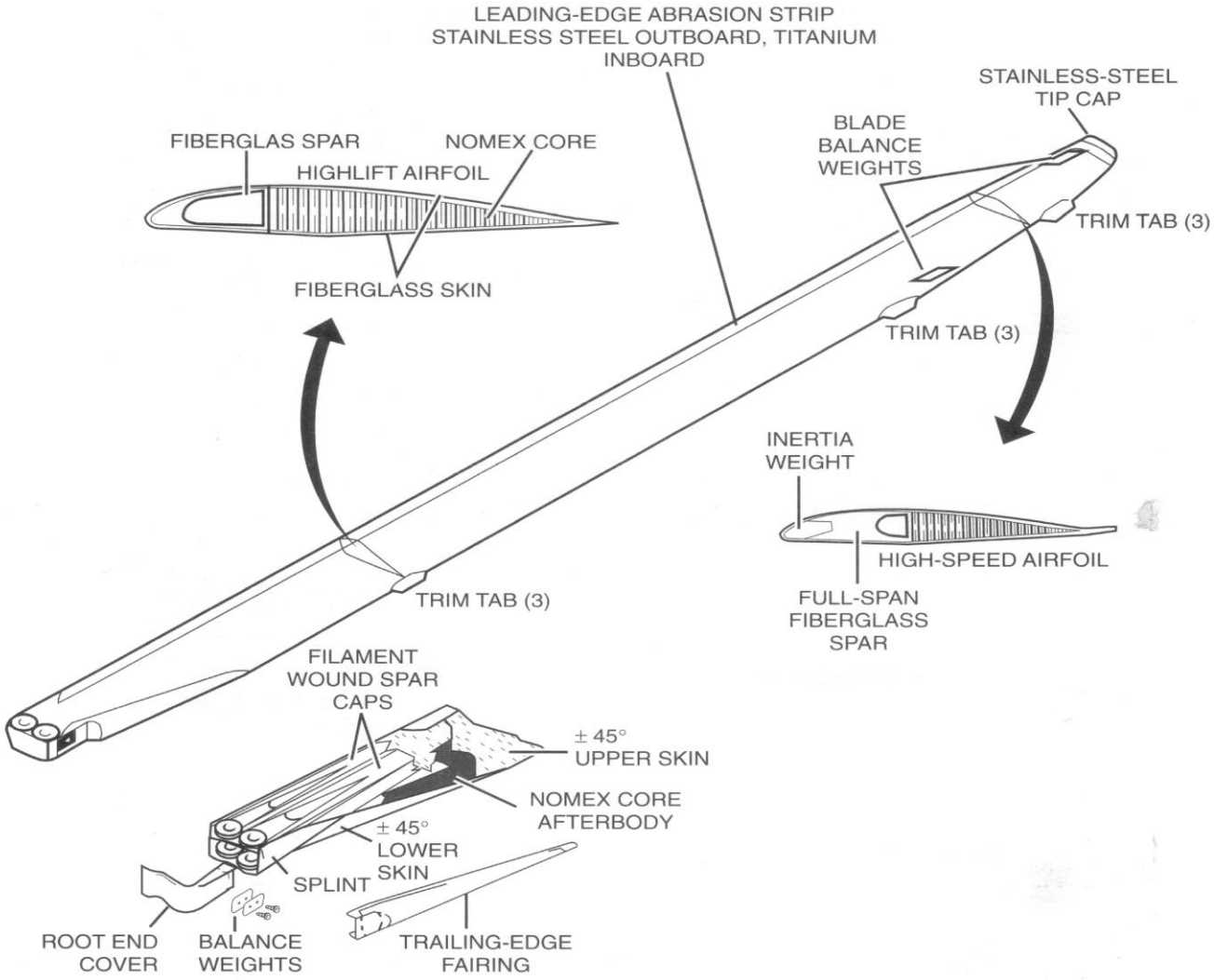
Vrste stabilizacijskih naprav – Fenestroni

- Prednosti:
  - boljši AD izkoristek,
  - manj vgradnih delov,
  - manjša mehanska obremenitev
  - večja varnost
- Slabost:
  - Večja možnost zasenčenja ⇨ izguba F_{RR}

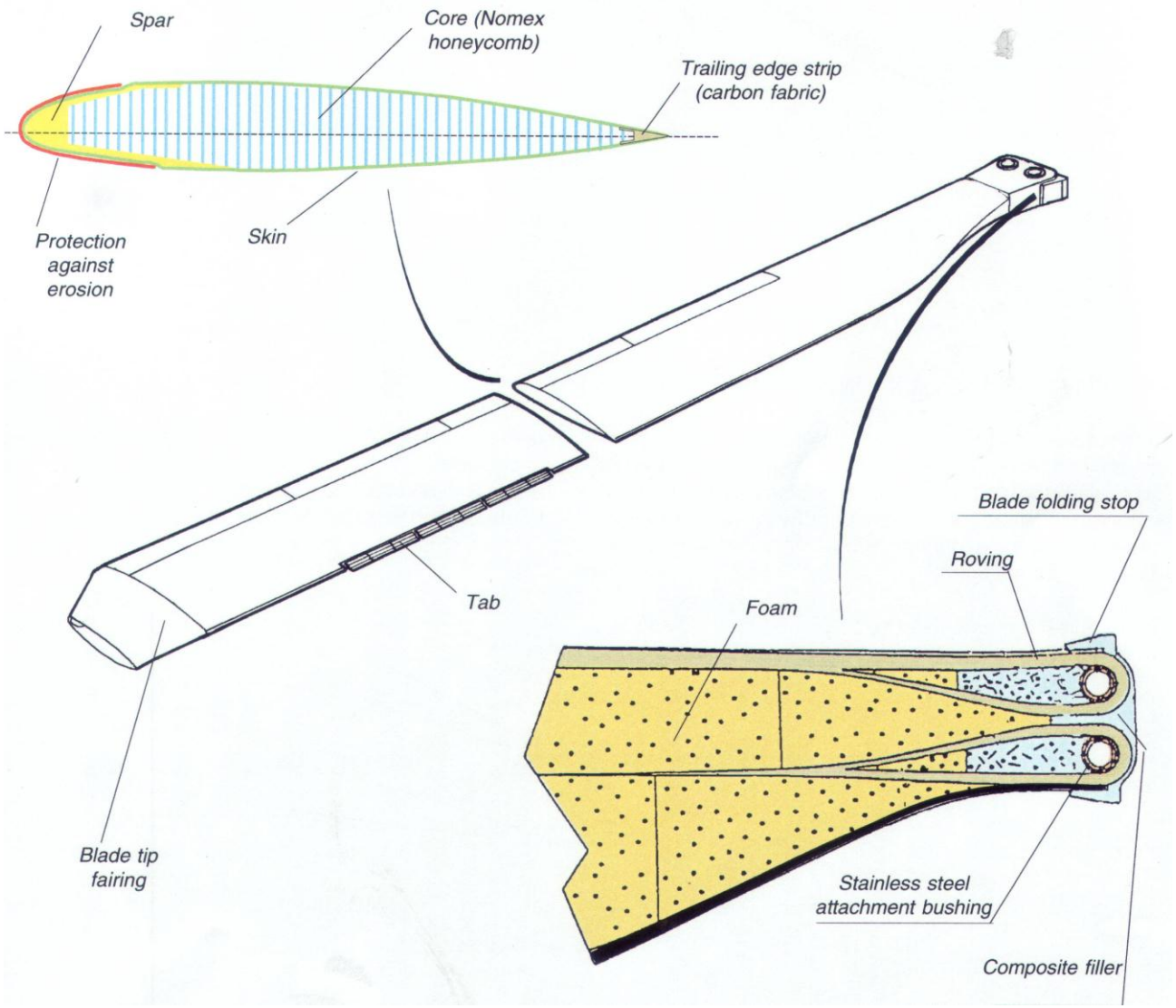
Vrste stabilizacijskih naprav - NOTAR SYSTEM



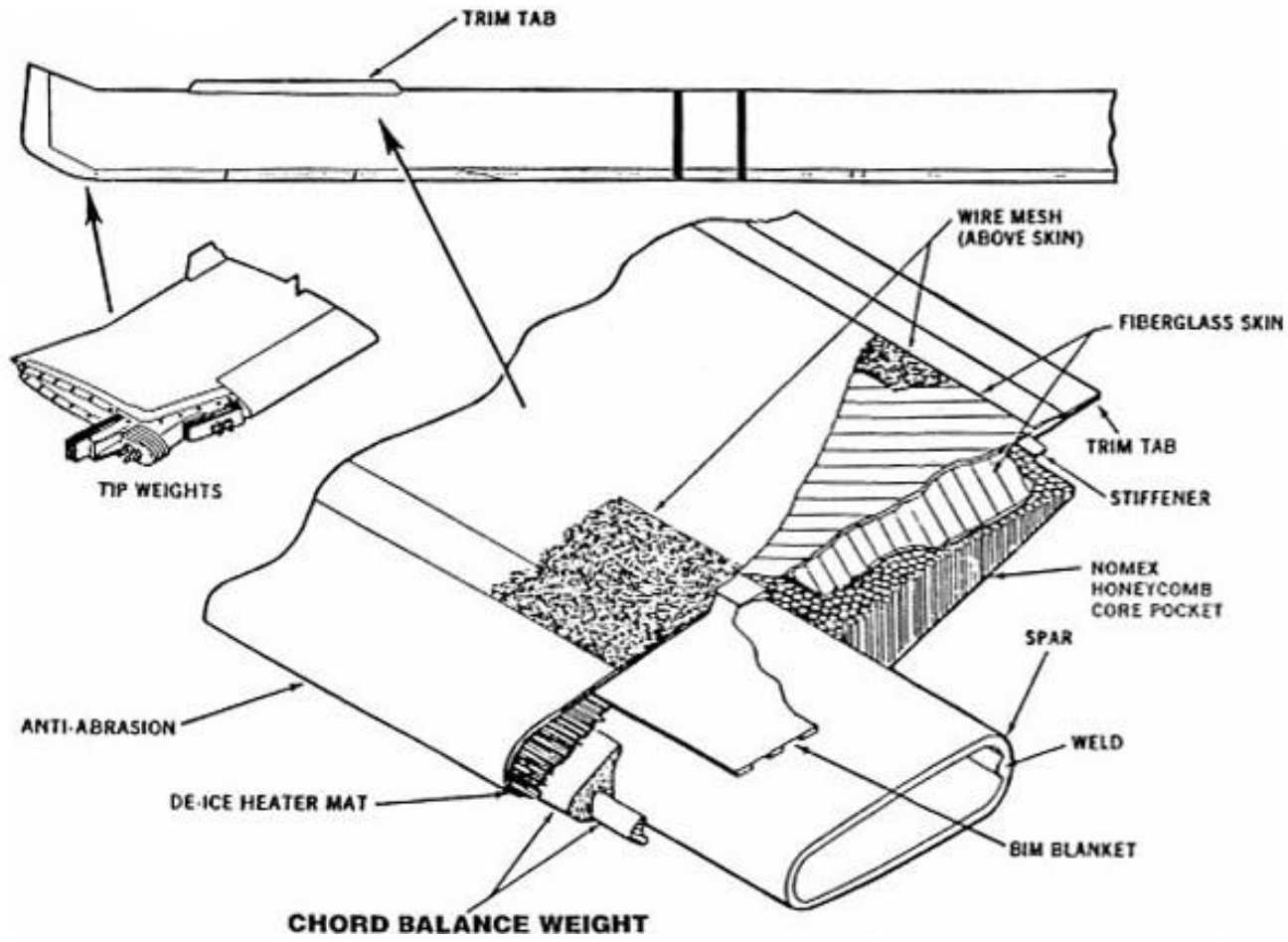
Design Lopatice Glavnega rotorja 1/3



Design Lopatice Glavnega rotorja 2/3

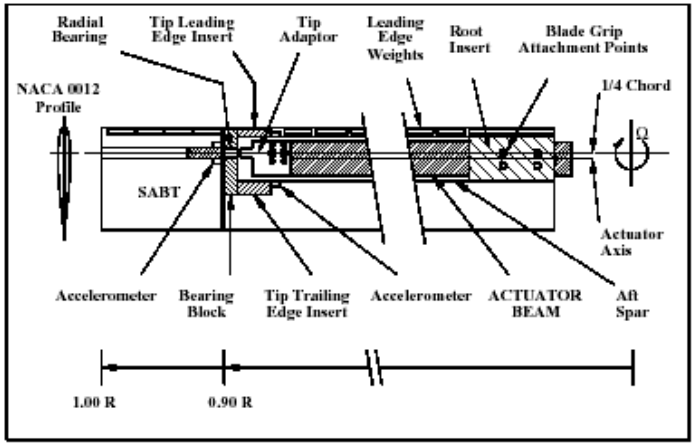


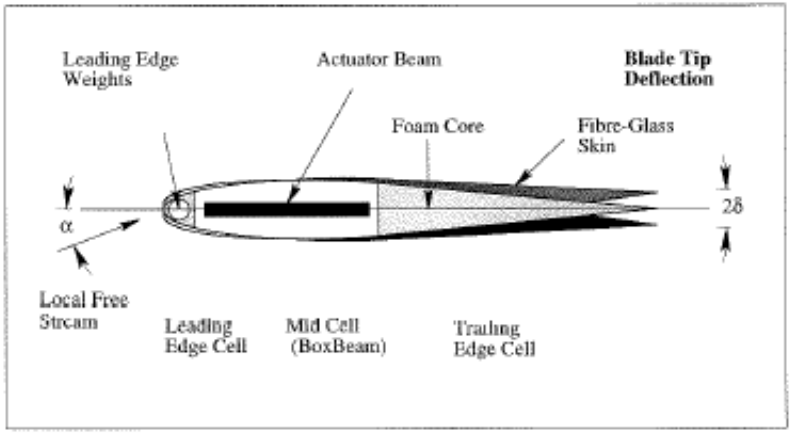
Design Lopatice Glavnega rotorja 3/3



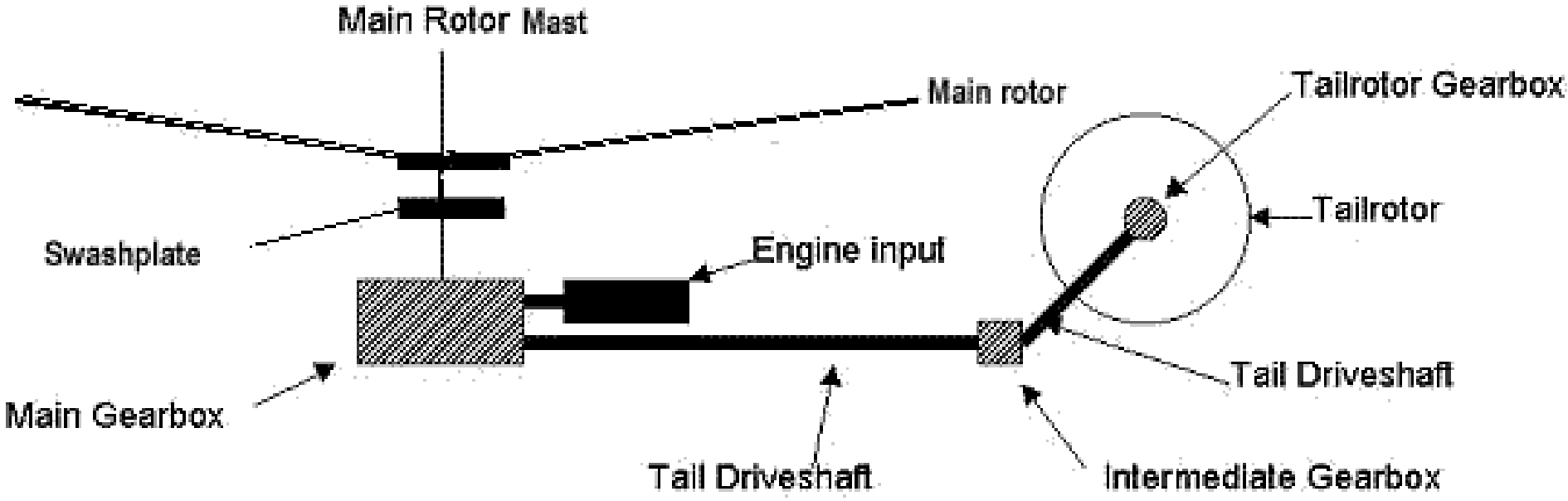
Pametne Lopatice Glavnega Rotorja

Piezoelectric Twist Actuation





http://www.glue.umd.edu/~bernhard/DOCS/sdm98.pdf



Typical Helicopter Drive Train