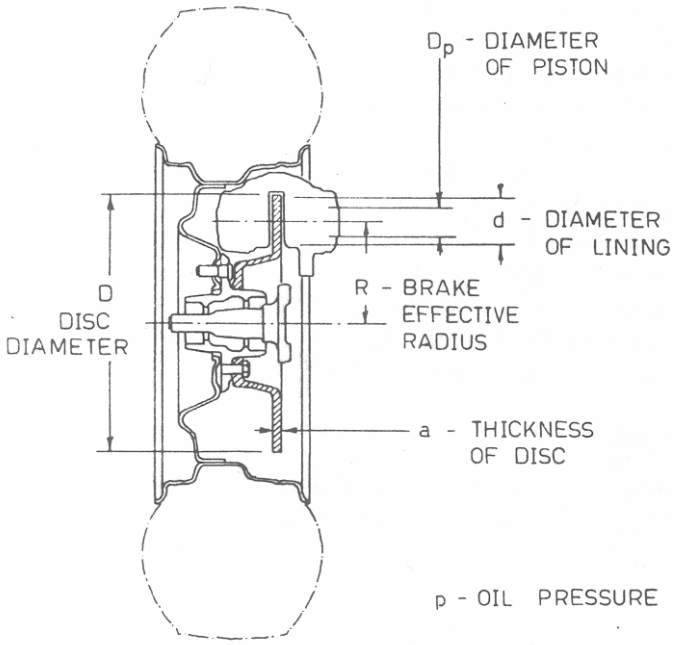
[Optimum Design of Caliper Disc Brake]
Group Project

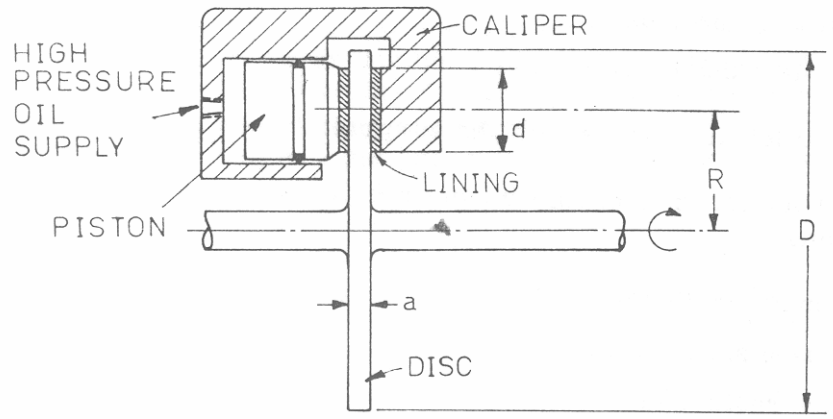
Design an optimum configuration and specifications for caliper disc brakes for vehicles. The design criterion is minimum stopping time.

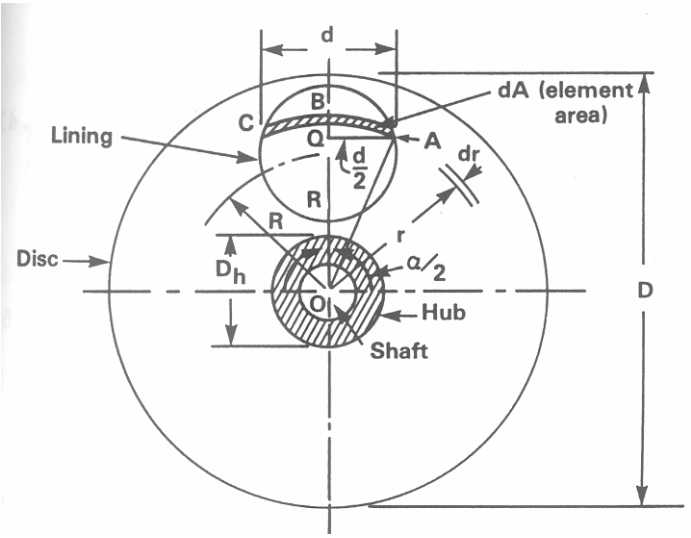
Caliper disc brakes first came into their own on European cars, the first applications being on competition and sports cars where their superior fade resistance and stability were particularly significant. The first problem encountered in adapting disc brakes to American cars was the greater weight of American cars as compared to European cars. This requires either much higher lining pressure or higher effective brake radius. But wheel rim configurations and space restrictions are assumed, and will represent constraints on the design for maximum effective brakes radius.

The designer must provide data for the following specifications:

- vehicle weight per wheel
- vehicle speed
- tire radius
- maximum disc diameter
- hub diameter
- maximum allowable disc temperature
- coefficient of friction between lining and disc
- maximum allowable lining pressure
- maximum available oil pressure
- coefficient of friction between tire and road


D_p - DIAMETER OF PISTON
d - DIAMETER OF LINING
R - BRAKE EFFECTIVE RADIUS
D DISC DIAMETER
a - THICKNESS OF DISC
p - OIL PRESSURE


CALIPER
HIGH PRESSURE OIL SUPPLY
d
LINING
R
PISTON
D
a
DISC


d
dA (element area)
B
C
A
Lining
Q
dr
$\frac{d}{2}$
R
r
Disc
D_h
$\alpha/2$
D
O
Hub
Shaft