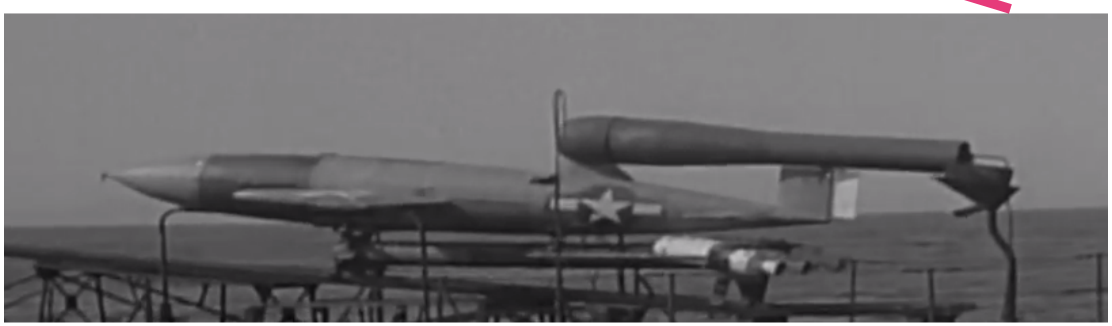
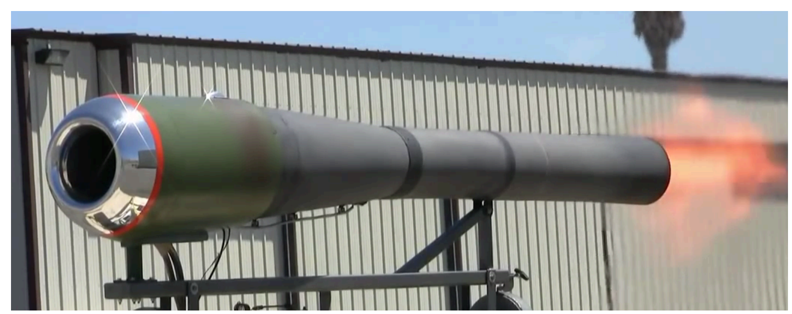
Homework 4.2

KGW-1 (later re-designated as LTV-N-2) was the US Navy's version of American flying bomb *JB-2 Loon*. It was developed to be carried on the aft deck of submarines in watertight containers. The first submarine to employ them was the SS-348 *Cusk* which successfully launched its first Loon on 12 February 1947 in Point Mugu, California. It has the following data:

- Static thrust 2200 N with air inlet speed of 180 m/s @ Sea Level
- Intake area 0.145 m^2
- Fuel is standard 80-octane gasoline having heating value $Q_R = 40$ MJ/kg
- Burner efficiency 0.90
- Typical flight duration is 1800 s
- Exhaust temperature 735 K

Assume Nozzle Optimized for Sea Level





Homework 4.2 (2)

Assume specific heat of air $Cp_a = 1.005 \frac{\text{kJ}}{\text{kgK}}$ and specific heat of hot gases $Cp_h = 1.12 \frac{\text{kJ}}{\text{kgK}}$

$$h_{fuel} = \eta_{combustor} \cdot Q_R$$

Calculate

1. Air mass flow rate into engine
2. Exhaust velocity
3. Maximum temperature inside the engine
4. Maximum pressure
5. Thrust specific fuel consumption (TSFC)
6. Average range *Launch Weight = 2,150 kg*
7. Mean L/D for (Sea Level) Cruise Conditions

Assume Stagnation (items 3–4)