Hydrazine Thrusters

RELIABLE CONTROL FOR SMALL AND MIDSIZE SPACECRAFT

Thruster-propulsion

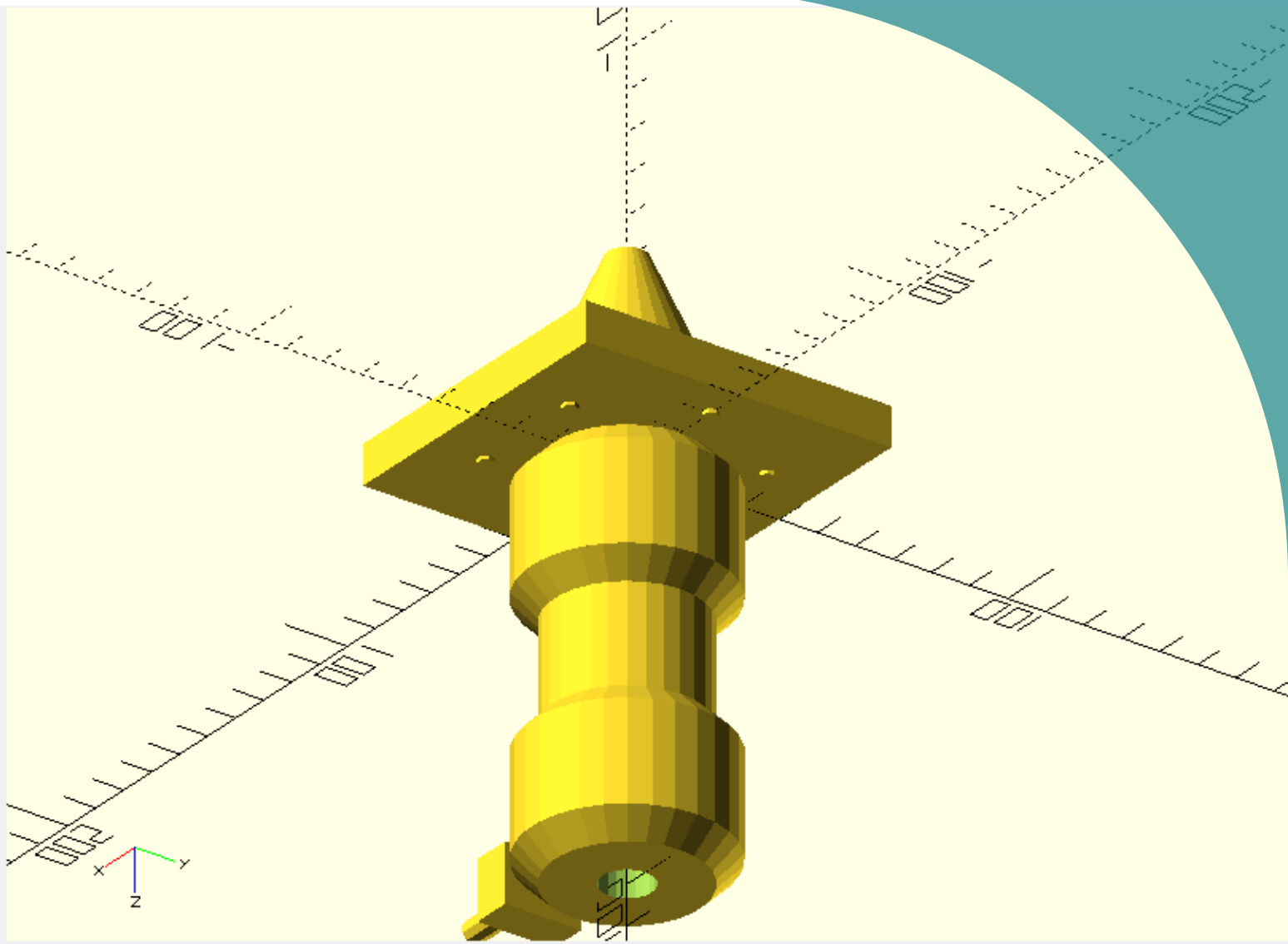
- The 1N monopropellant hydrazine thruster is a small rocket engine for attitude-, trajectory- and orbit-control of small satellites. More than 500 units of this thruster operate successfully in space. Generally, the 1 N thruster is part of the satellite propulsion subsystem. Each thruster is equipped with a flow control valve, consisting of two identical monostable, normal ly-closed valves placed in series within a single housing.

```
    // Agujeros incluidos
    dentro del módulo
}

module visual_bolts(n = 6) {
    bolt_d = 3;
    bolt_h = 4;
    radius = (body_d + 10) / 2;

    for (i = [0:n-1]) {
        angle = 360 / n * i;
        rotate([0, 0, angle])
        translate([radius, 0, -
    bolt_h])
            cylinder(h=bolt_h,
    d=bolt_d);
    }
}

module valve_box() {
    box_w = 20;
    box_h = 15;
    box_d = 10;
    translate([body_d / 2 + 5,
```



Consola

```
Loaded design 'C:/Users/PC/Downloads/hydrazine_thruster_2.scad'.
Compiling design (CSG Tree generation)...
Compiling design (CSG Products generation)...
Geometries in cache: 47
```

Error-Log

Show

Group

HYDRAZINE/ION THRUSTER CONCEPT

- Product Type:

- Compact High-Precision Ion/Hydrazine Thruster Unit

  Micro- to small-scale spacecraft propulsion for orbital maneuvering, attitude control, and station keeping.

Characteristics	
Thrust Nominal	1 N
Thrust Range	0.320 ... 1.1 N
Specific Impulse, Nominal	220 s
Pulse, Range	200 ... 223 s
Mass Flow, Nominal	0.44 g/s
Mass Flow, Range	0.142 ... 0.447 g/s
Inlet Pressure Range	5.5 ... 22 bar
Minimum Impulse Bit	0.01 ... 0.043 Ns
Nozzle Expansion Ratio	80
Mass, Thruster with valves	290 g
Propellant	Hydrazine (N_2H_4), High-Purity Grade
Qualification	
Total Impulse	135,000 Ns
Cycle Life	59,000 cycles

Characteristics

- – Total Thruster Height: 101.6 mm (4 inches)
  – Thruster Diameter: 50.8 mm (2 inches)
  – Chamber Height: 25.4 mm (1 inch)
  – Base and Top Chamfers: 4 × 4.76 mm (3/16 inch)
  – Axle Bore Diameter: 12.7 mm (1/2 inch + tolerance)
  – Lower & Upper Grip Height: 17.46 mm (approx.)
  – Hexagonal Injector Pocket (Big): ~36.5 mm flat-to-flat
  – Hexagonal Injector Pocket (Small): ~25.9 mm flat-to-flat

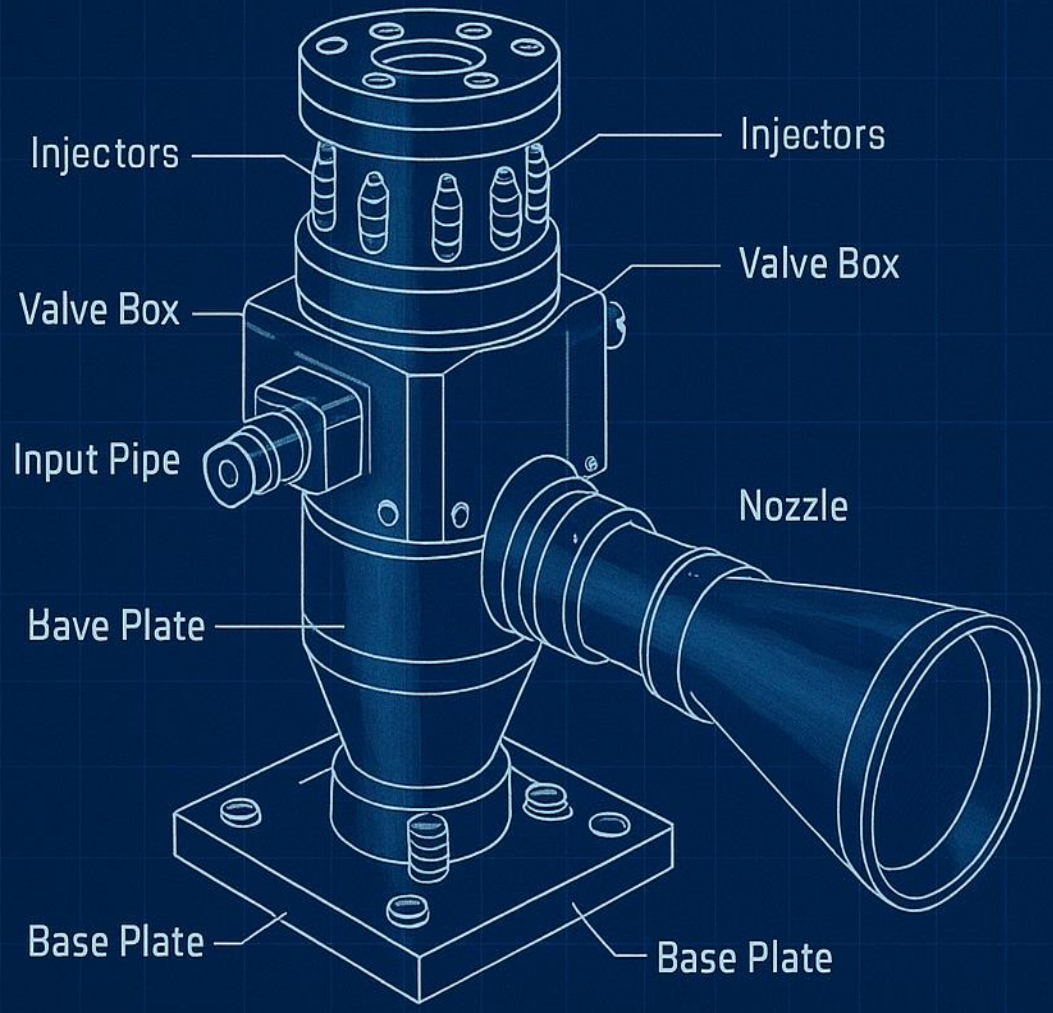
Product

- – Dual compatibility with ionized gas injection or monopropellant (hydrazine) pulse feeds
  – Propellant Compatibility: N_2H_4 (hydrazine), xenon plasma, or similar
  – Injector Array Support: 3–6 modular nozzles in equidistant hex pattern
  – Central axial plasma or fuel conduit
  – Back-vented ionization grid chamber for ion thruster configuration
  – Nozzle cone geometry optimized for low-volume thrust pulses and focused vectoring
  – Expandable with external ionization or RF coil modules
  – Materials compatible with pressurized and corrosive fluid environments (e.g., titanium alloy or Inconel recommended in physical models)
-

- THERMAL AND STRUCTURAL CONSIDERATIONS
- – Chamfer design improves thermal dissipation
  – Symmetric cylindrical mass distribution to ensure rotational stability
  – Can be integrated into clustered propulsion systems (e.g., quad-layout or ring assembly)
  – Reinforced base and top ring for increased torque during mounting or orbital ignition cycles

Design

400N Mono-Propellant



KEY TECHNICAL CHARACTERISTICS

Thrust Range	120-420 N
Supply Pressure	5.5-25 bar
Nominal Mass Flow Range	58-190 g/s
Nominal Specifit Impulse Range	2080-2155 Ns/kg
Minimum Impuise Bit Range	< 9 Ns
Shortest On-time	16ms
Nozzle Area Ratio	30
Propellant	PI-design
Qualification	<188kNs
Total nuob,of pulses	>3900
Total hydrazine throughput	>850 s
Total operating time	>850 s
Longest steady statt	450 s