

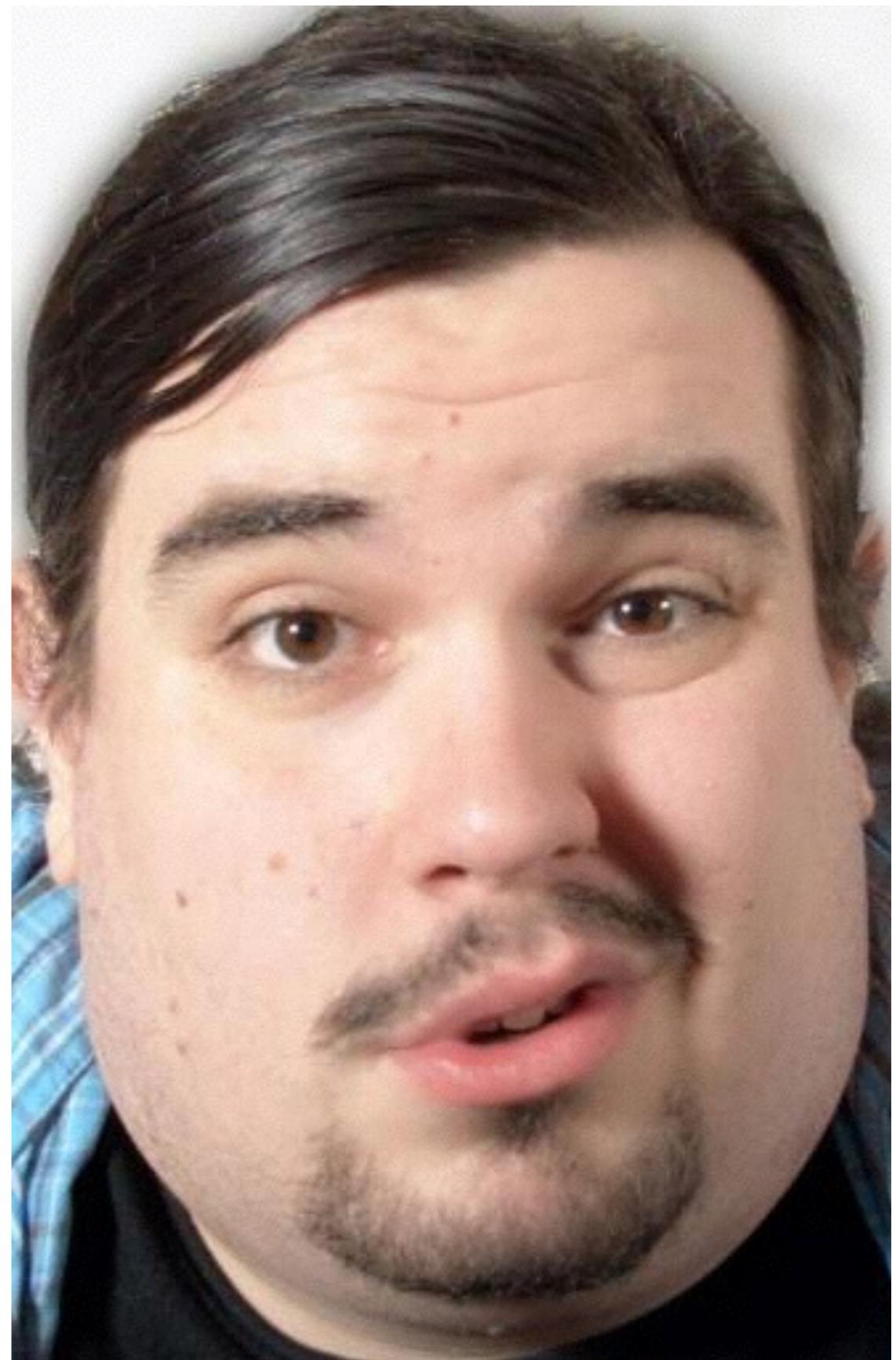


Programming Rocket Ships

for no good reason

Me

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<https://github.com/gisikw>
<https://cheerskevin.com>



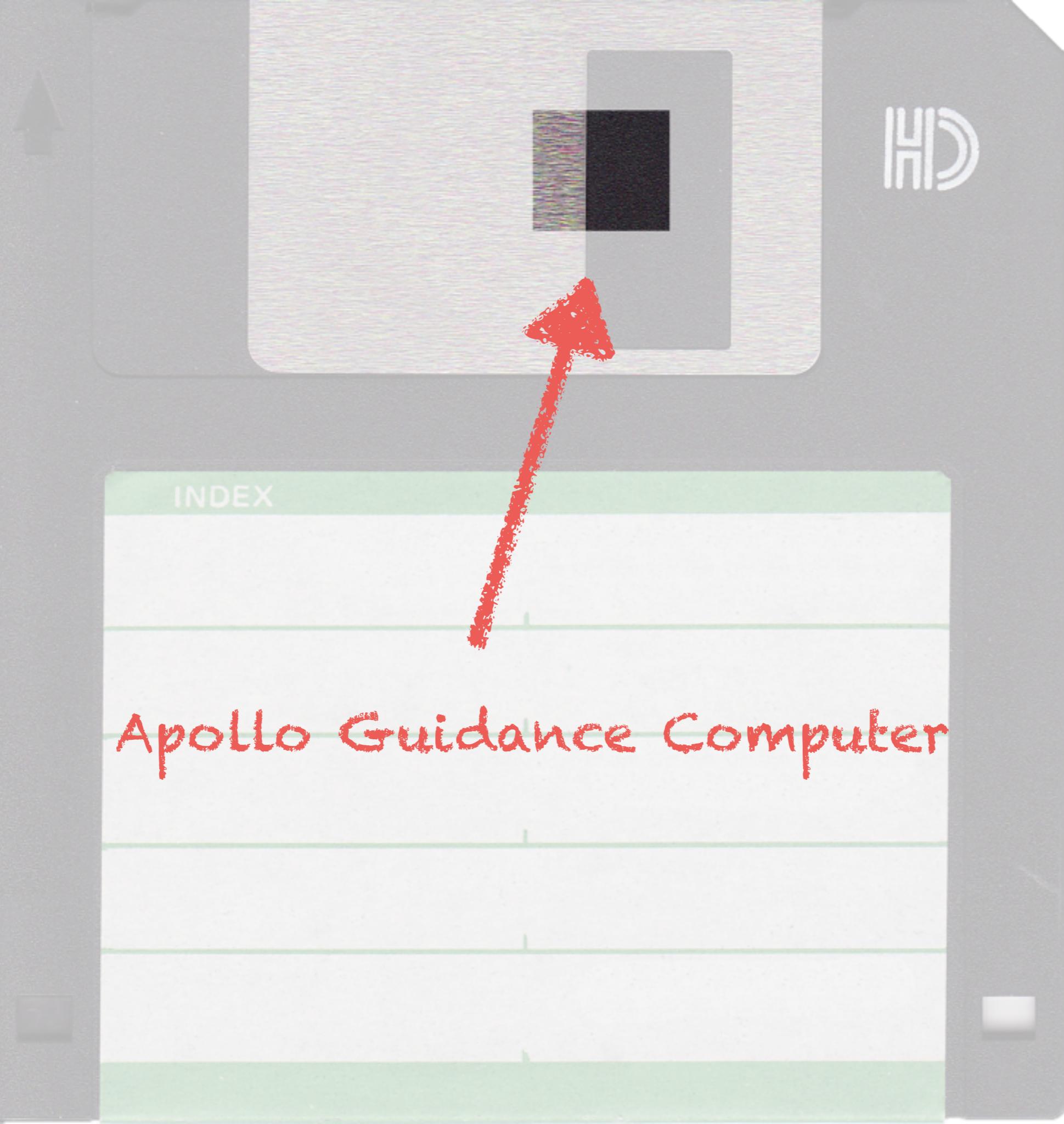
Apollo Guidance Computer





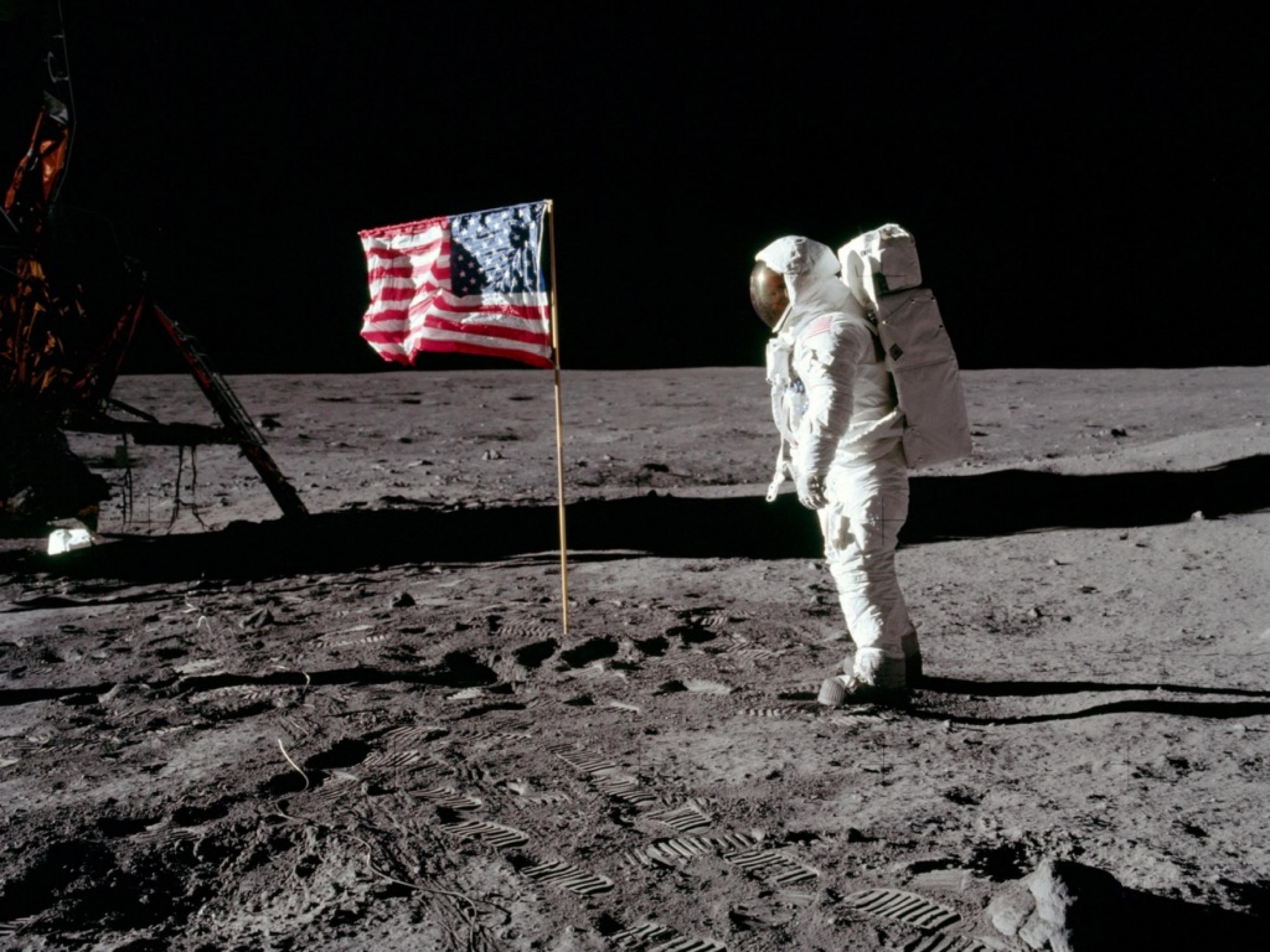
HD

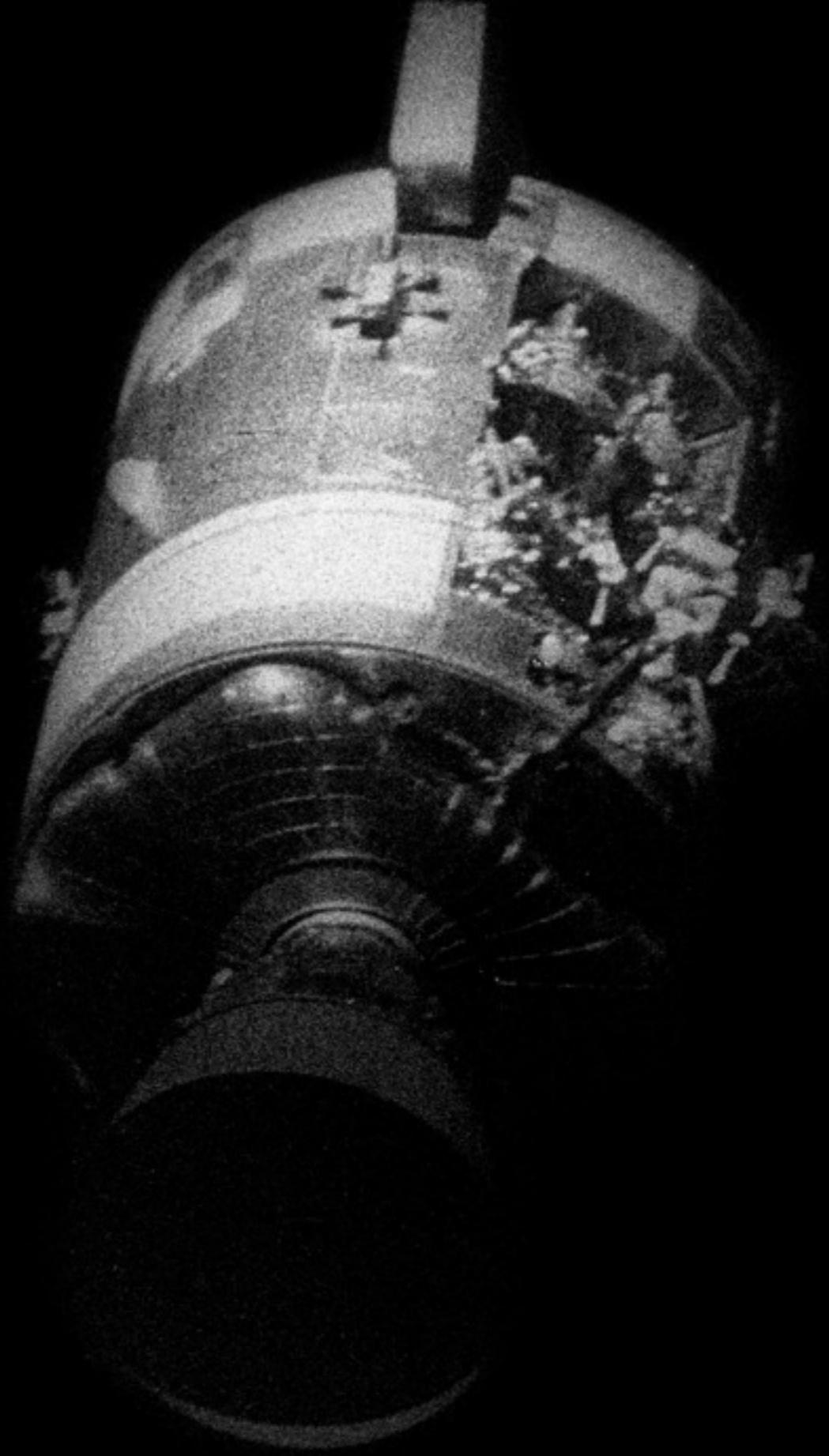
INDEX

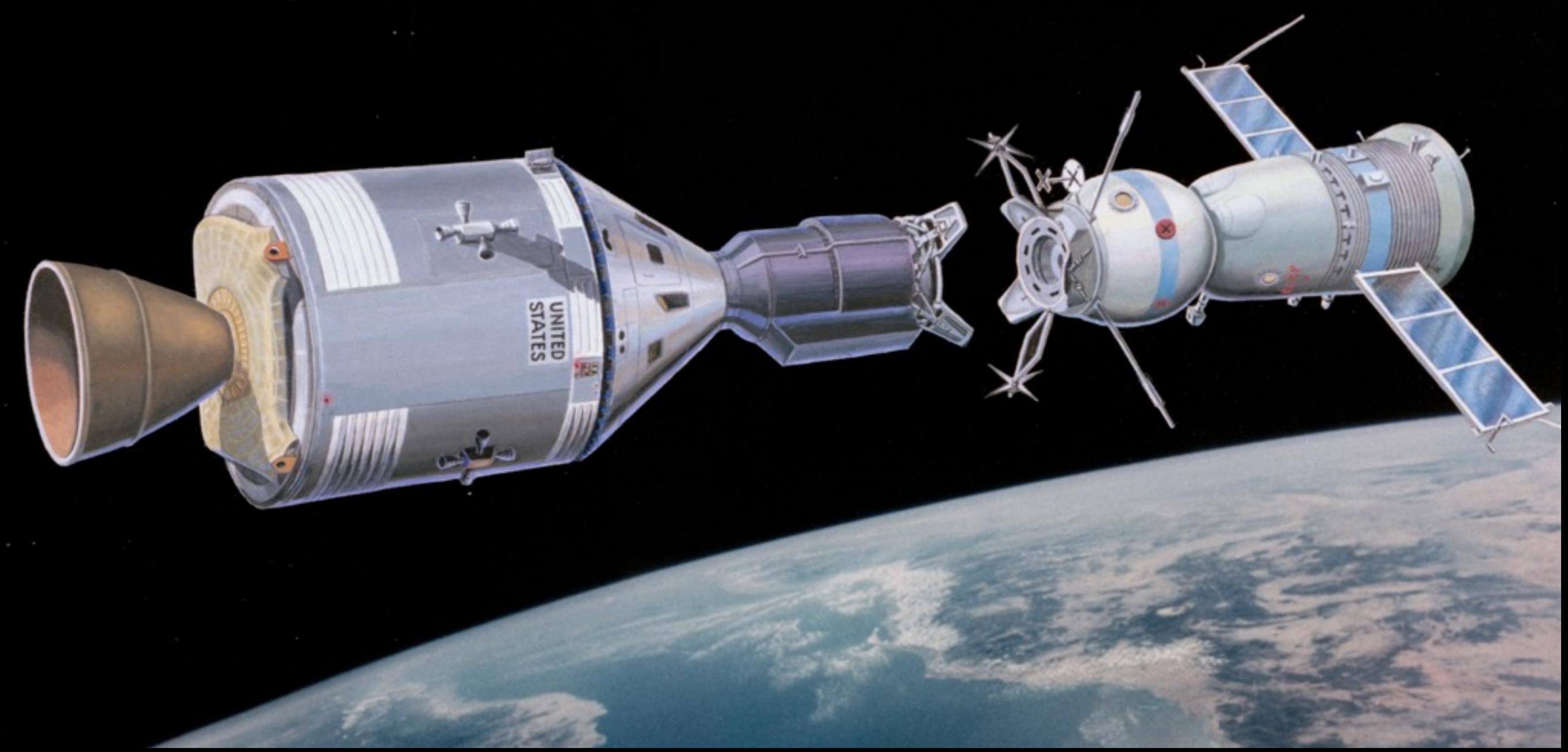


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Apollo Guidance Computer



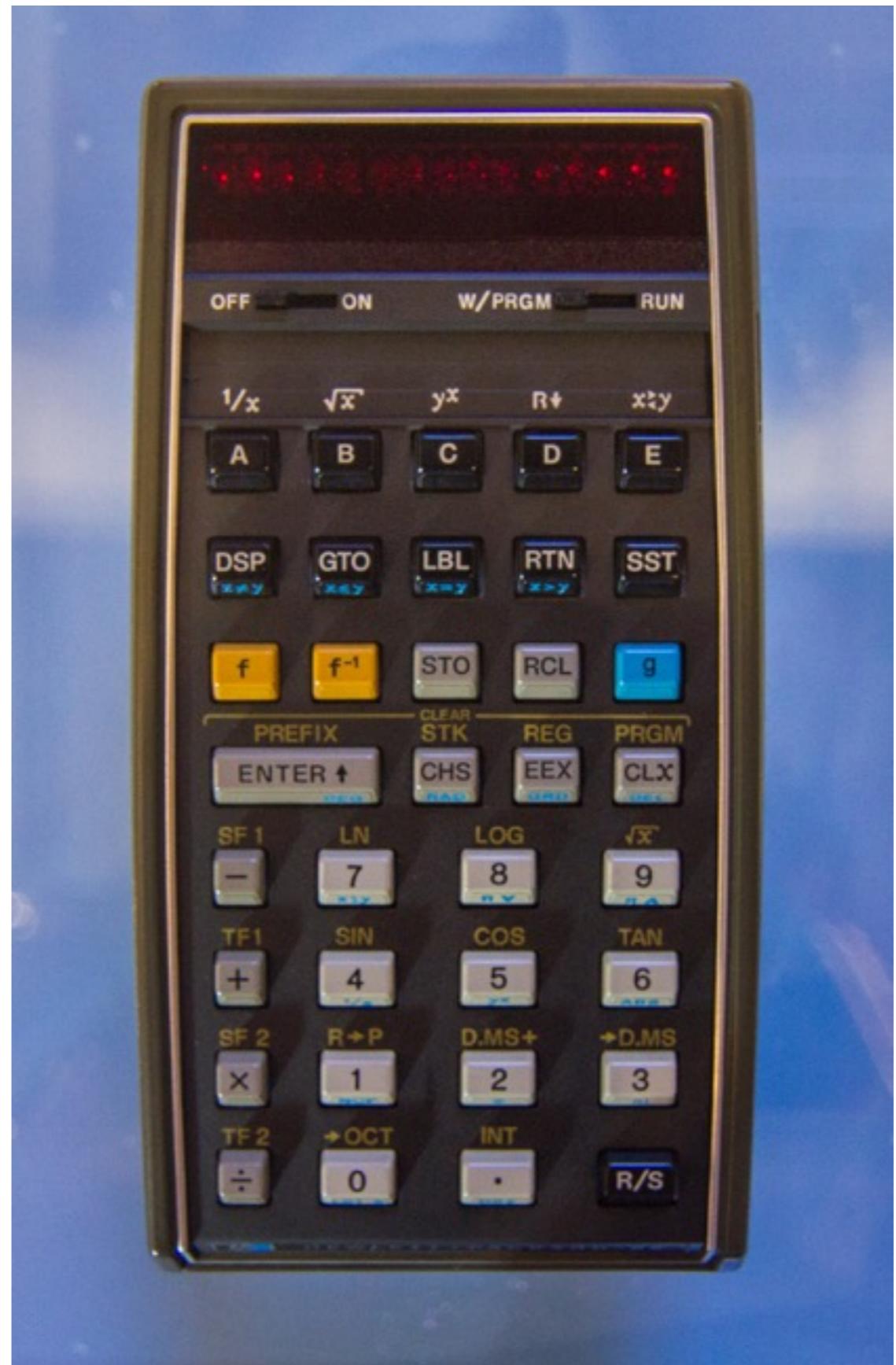






HP-65

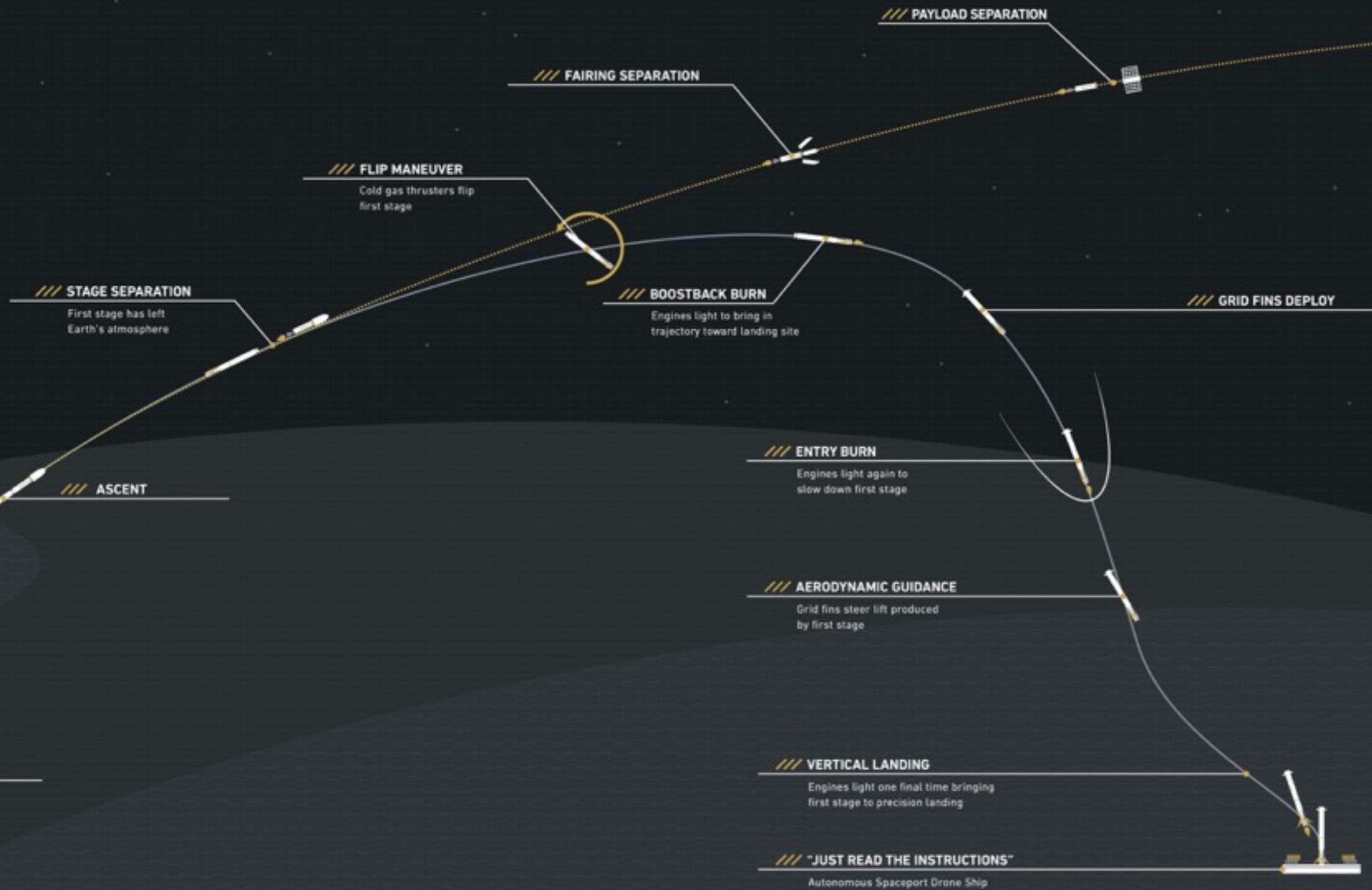
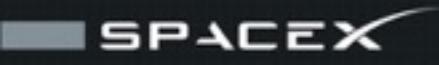
“Better then the
AGC!”

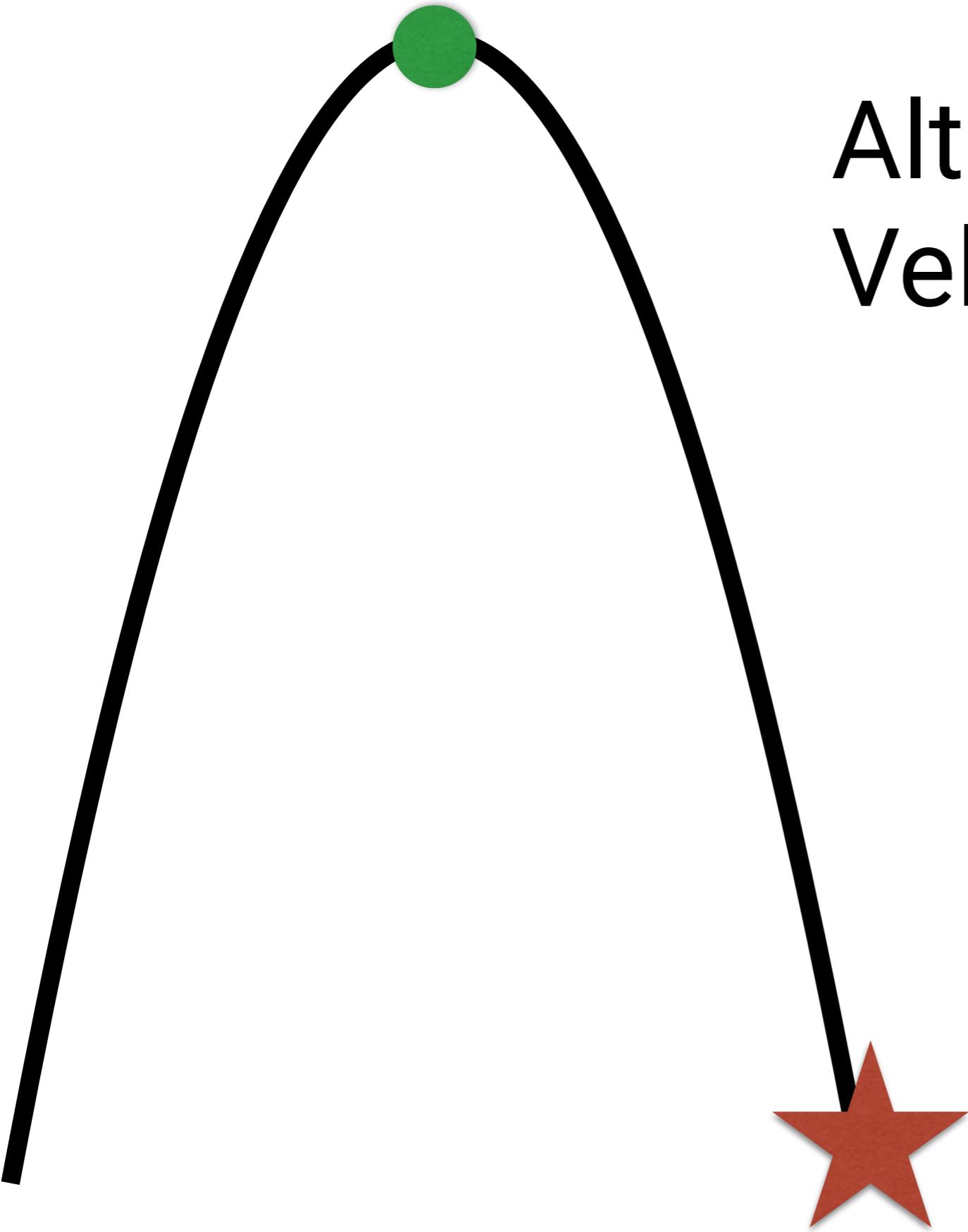






How do?



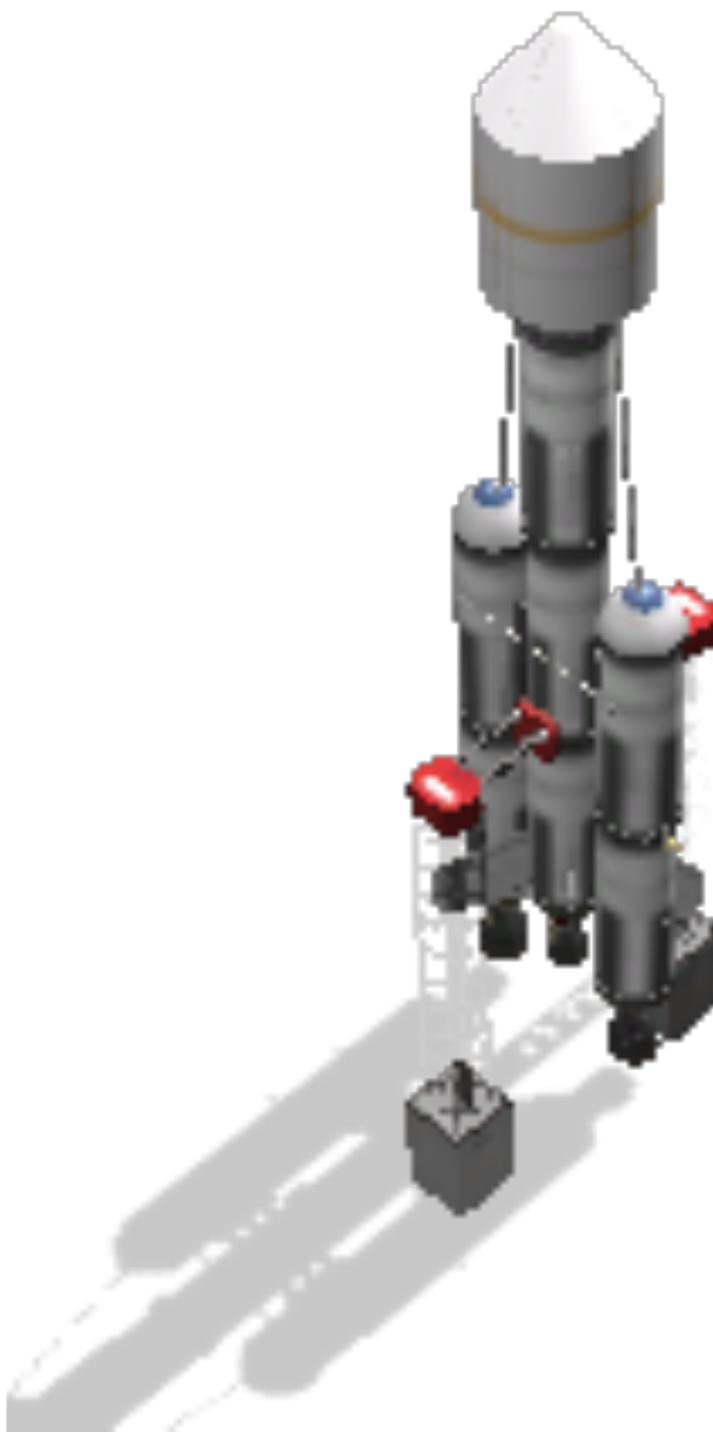


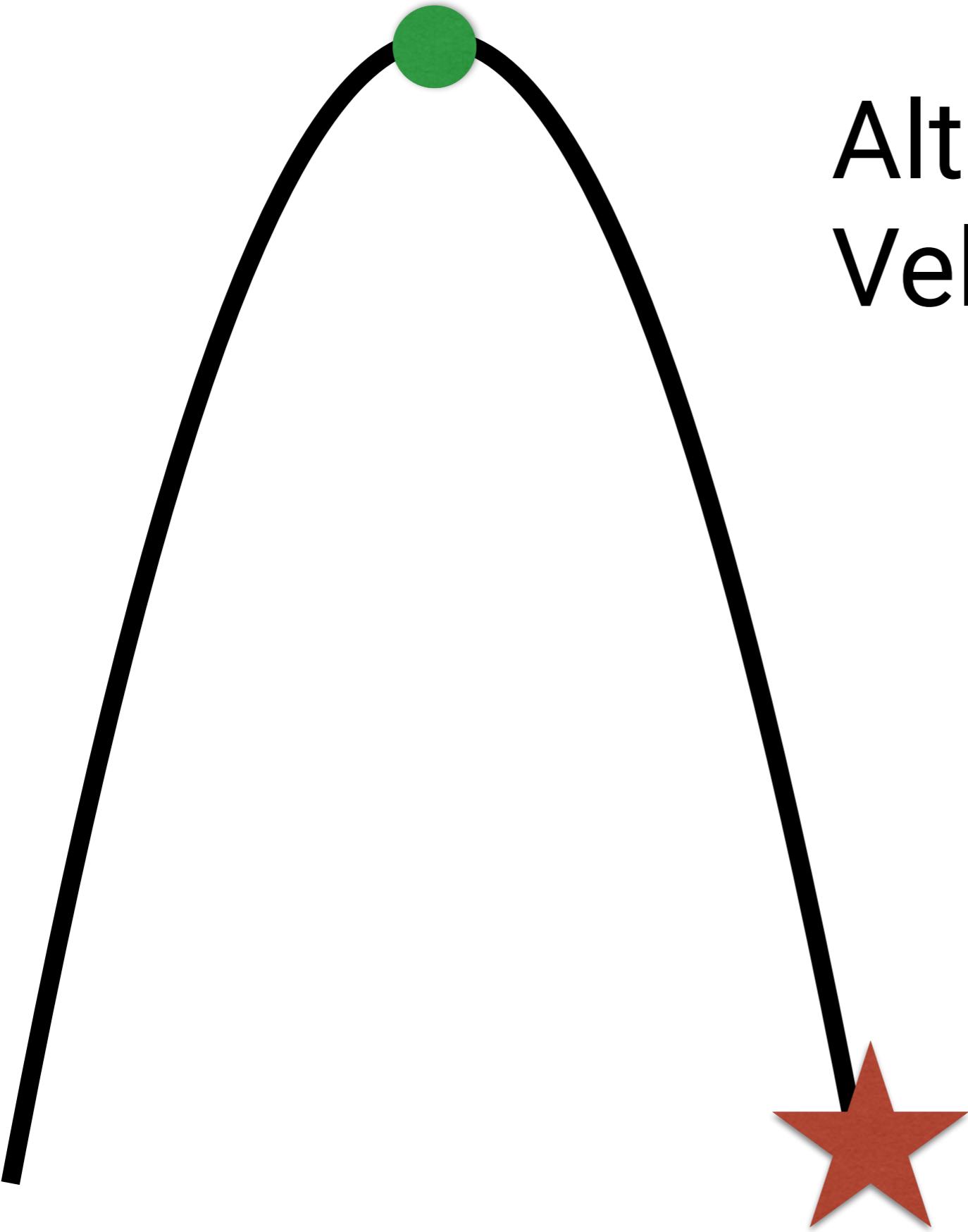
Altitude: 100km
Velocity: 0m/s

9.7 m/s^2



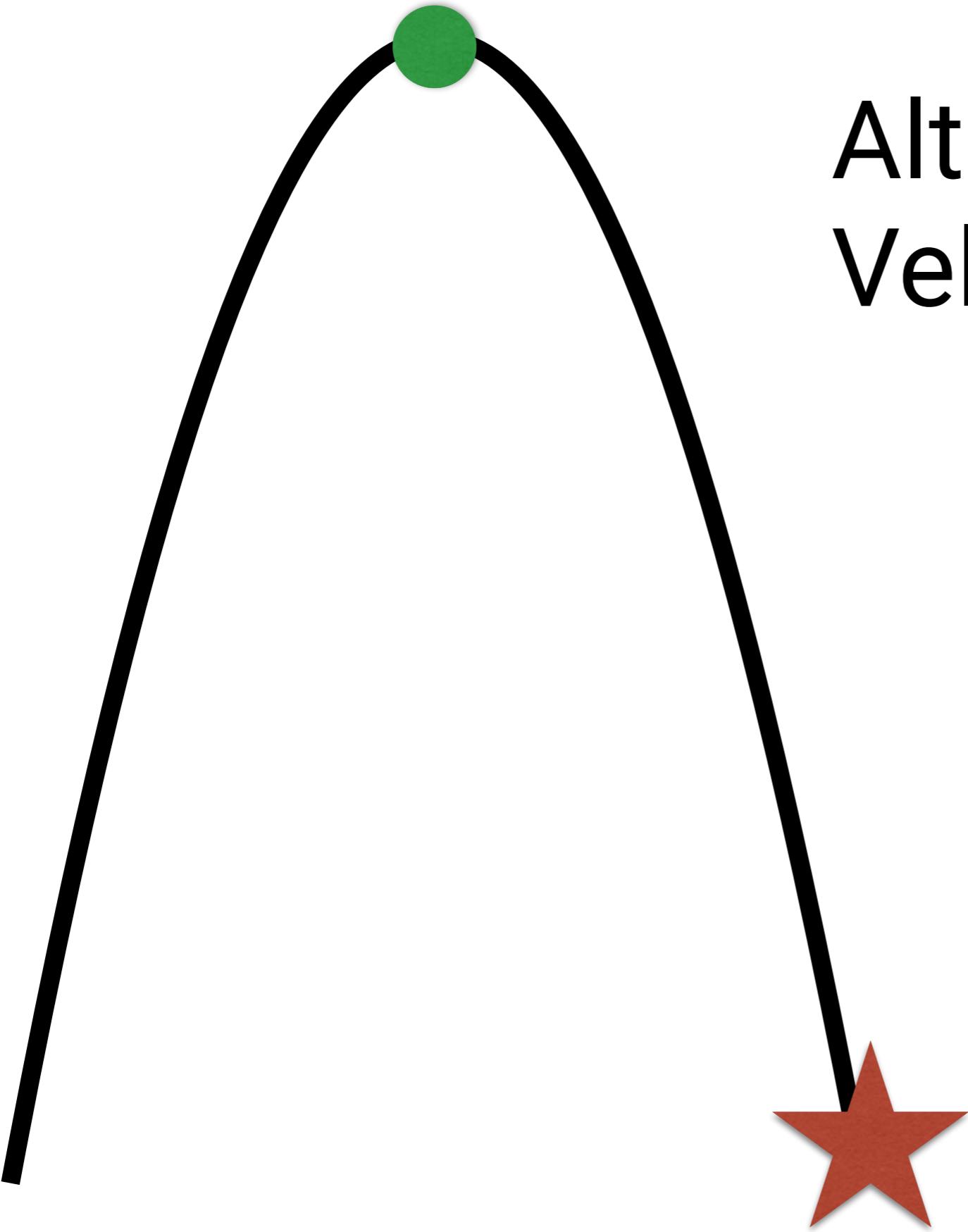
9.8 m/s^2



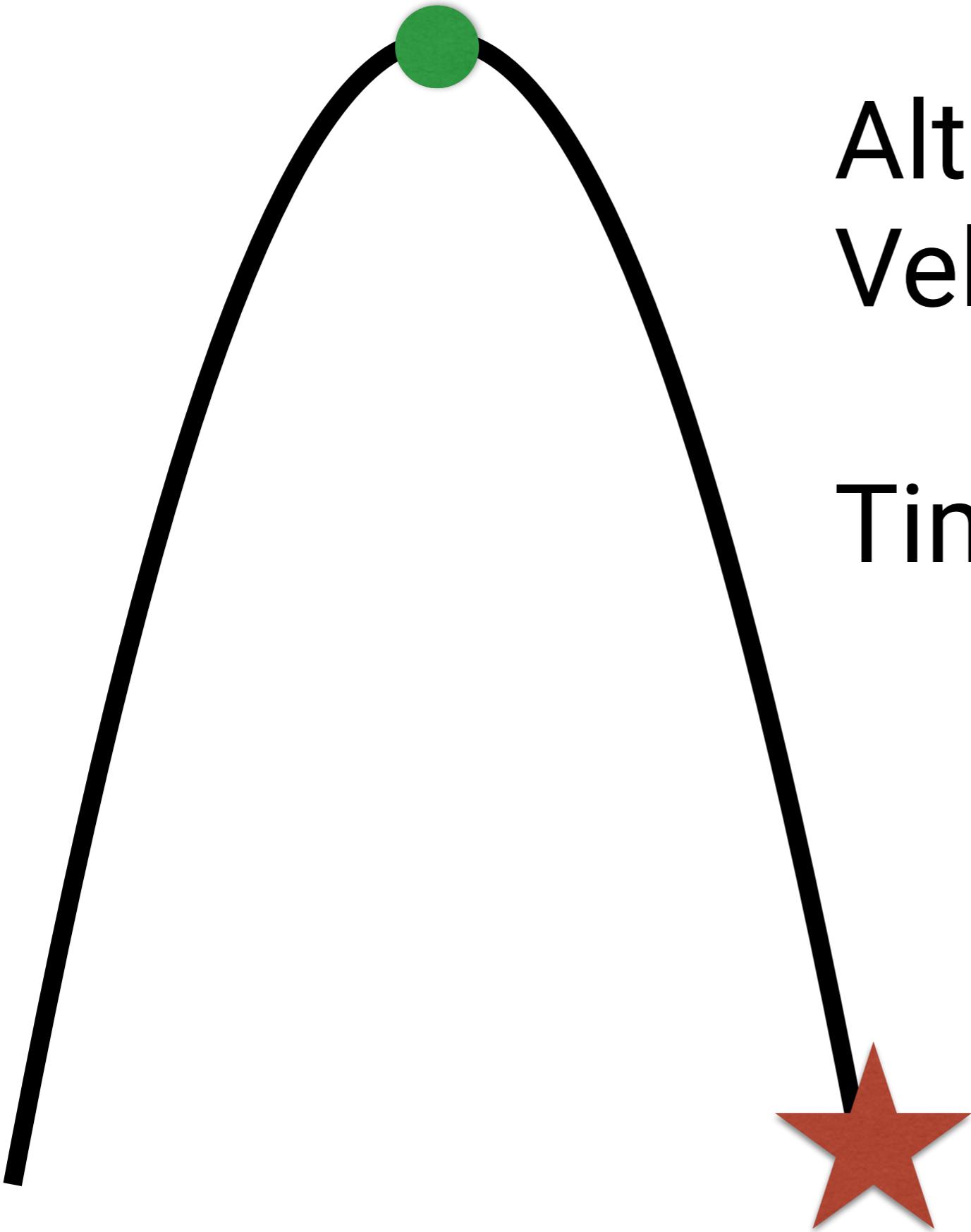


Altitude: 100km
Velocity: 0m/s



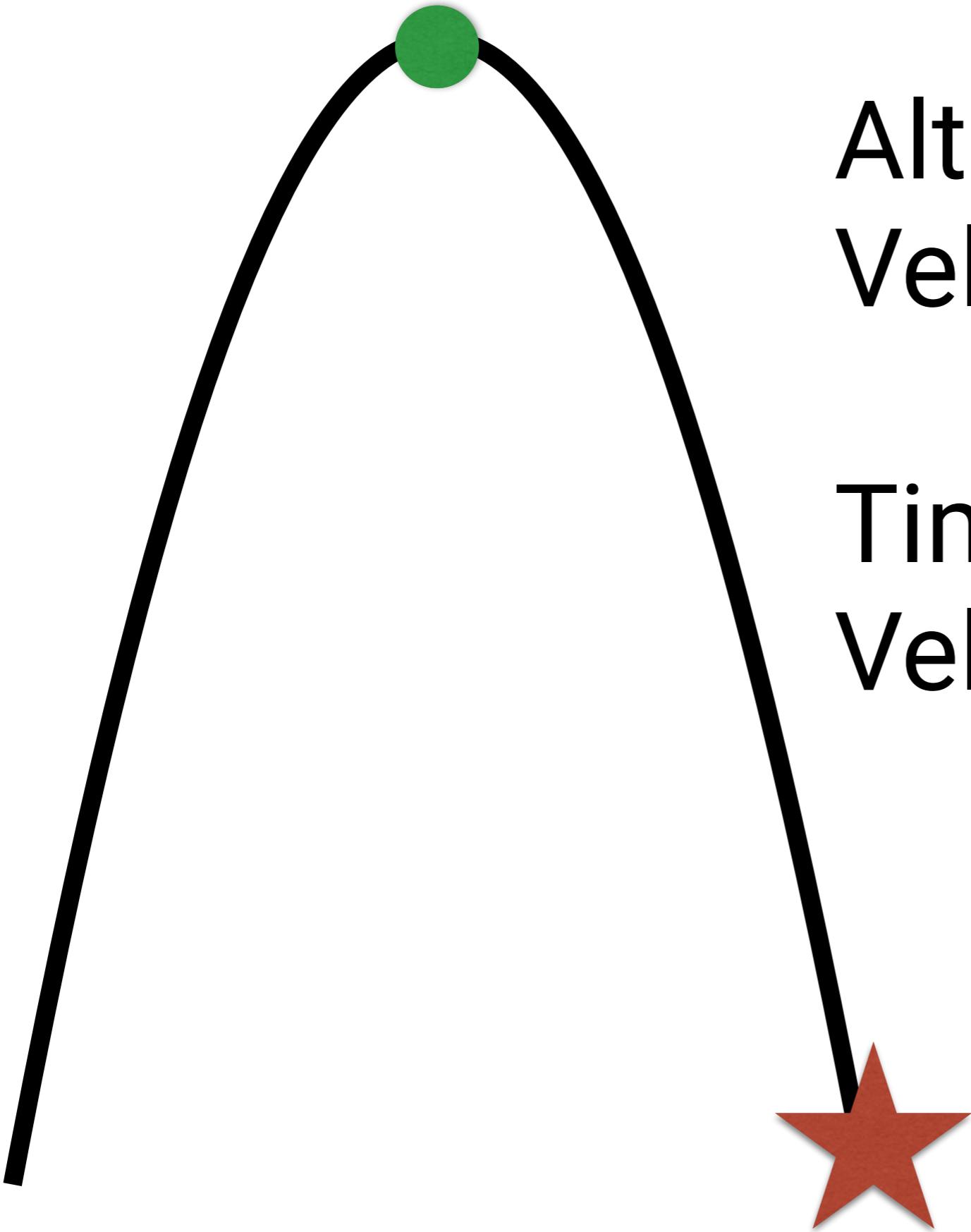


Altitude: 100km
Velocity: 0m/s



Altitude: 100km
Velocity: 0m/s

Time: 142.8s



Altitude: 100km
Velocity: 0m/s

Time: 142.8s
Velocity: 1399m/s

The background of the image is a deep space scene filled with numerous galaxies of various sizes and colors, primarily in shades of blue, green, and red. The galaxies are scattered across the frame, with some appearing as small points of light and others as larger, more luminous structures.

Bad Assumptions!

“Don’t Crash Formula”

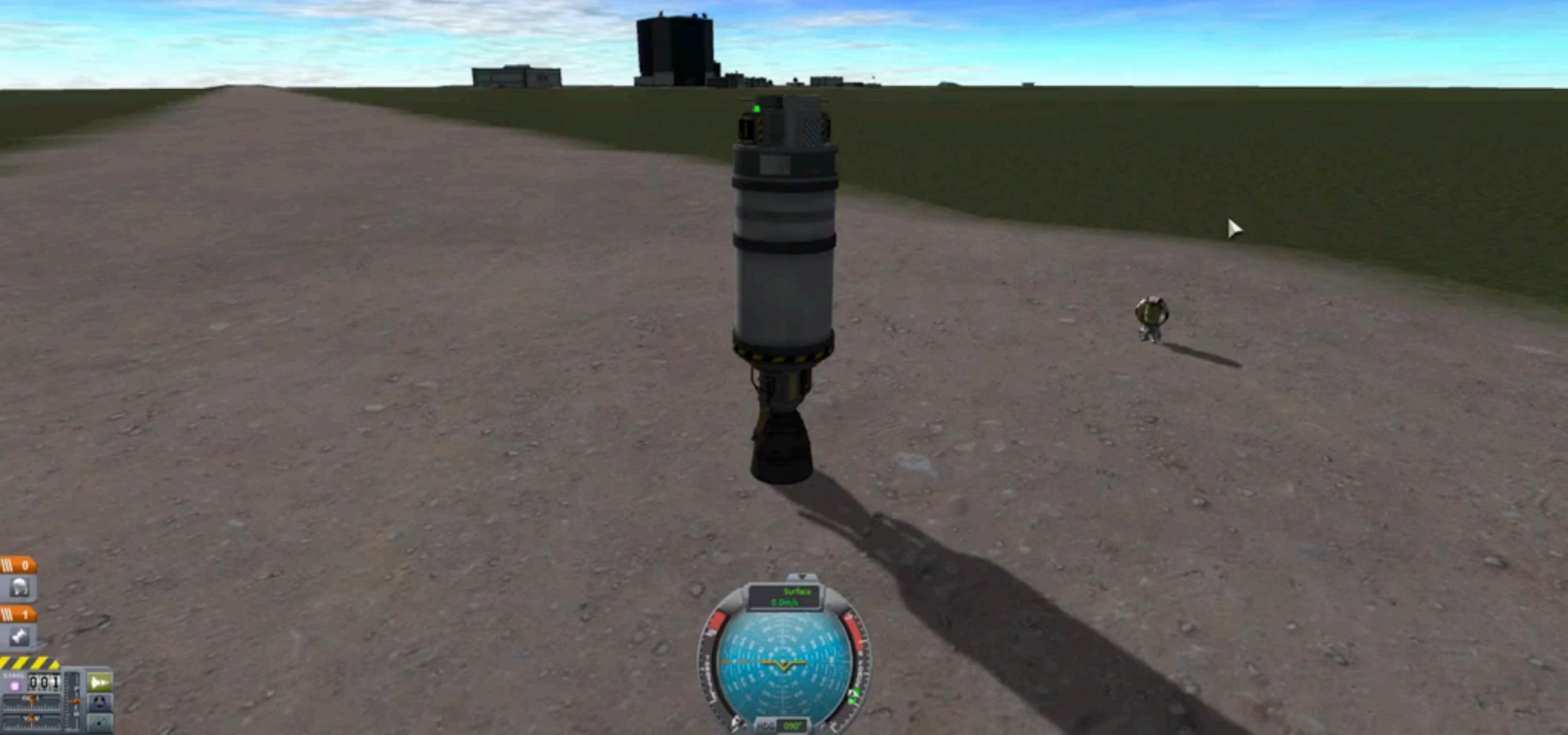
```
until landed {  
    wait until we would impact  
    throttle up!  
    wait until we're going slow  
    throttle down!  
}
```

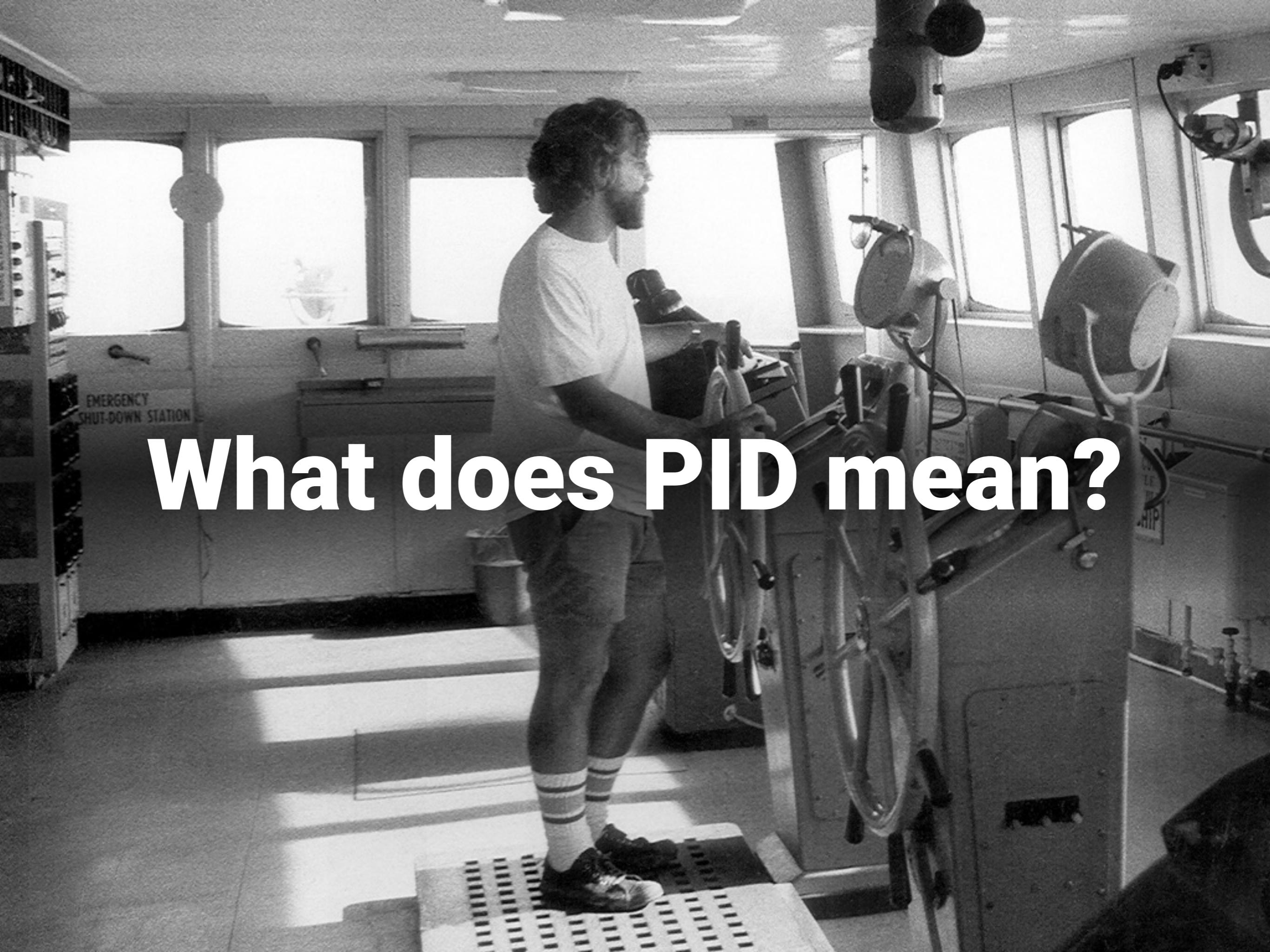


KSP & kOS

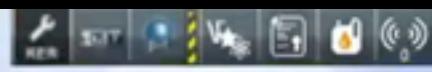
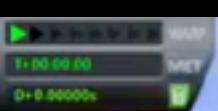


PID Controllers



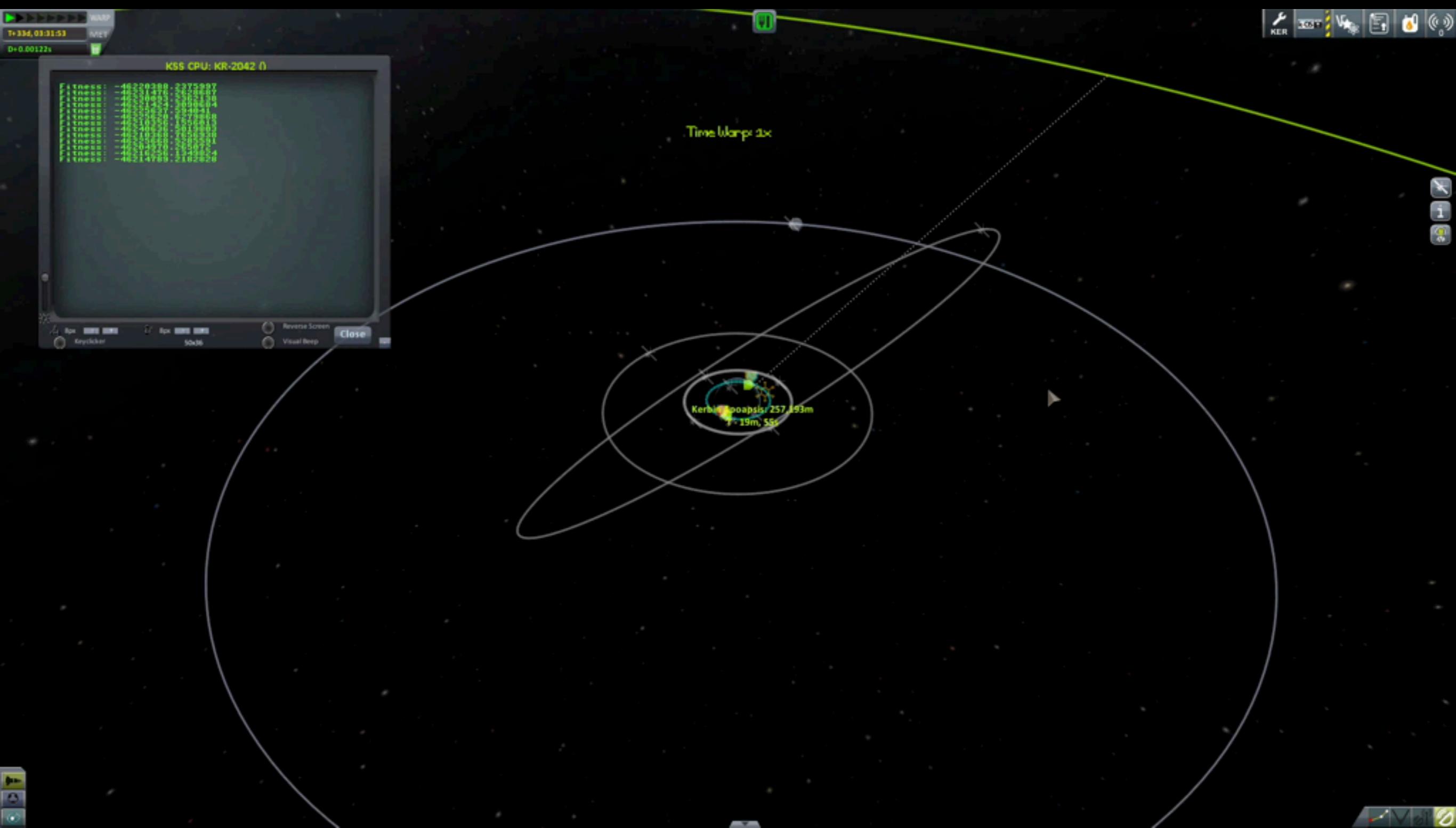


What does PID mean?



A photograph of a person standing on a rocky mountain peak, silhouetted against a bright, star-filled sky. The sky is filled with numerous stars of varying sizes and colors, from small white dots to large, multi-pointed stars. The mountain peak is rugged and rocky, with some snow or ice visible on its slopes. The overall atmosphere is one of adventure and exploration.

Hill Climbing



A vibrant, multi-colored nebula dominates the center of the image, featuring shades of blue, green, red, and orange. Several bright, yellowish-white stars of varying sizes are scattered across the dark, star-filled background. The nebula's structure is complex, with various gas clouds and dust lanes.

Genetic Algorithms

Genetic Algorithm

Given a starting population

Until done

 Evaluate all members

 Select parents

 Crossover parents into
 children

 Add mutation

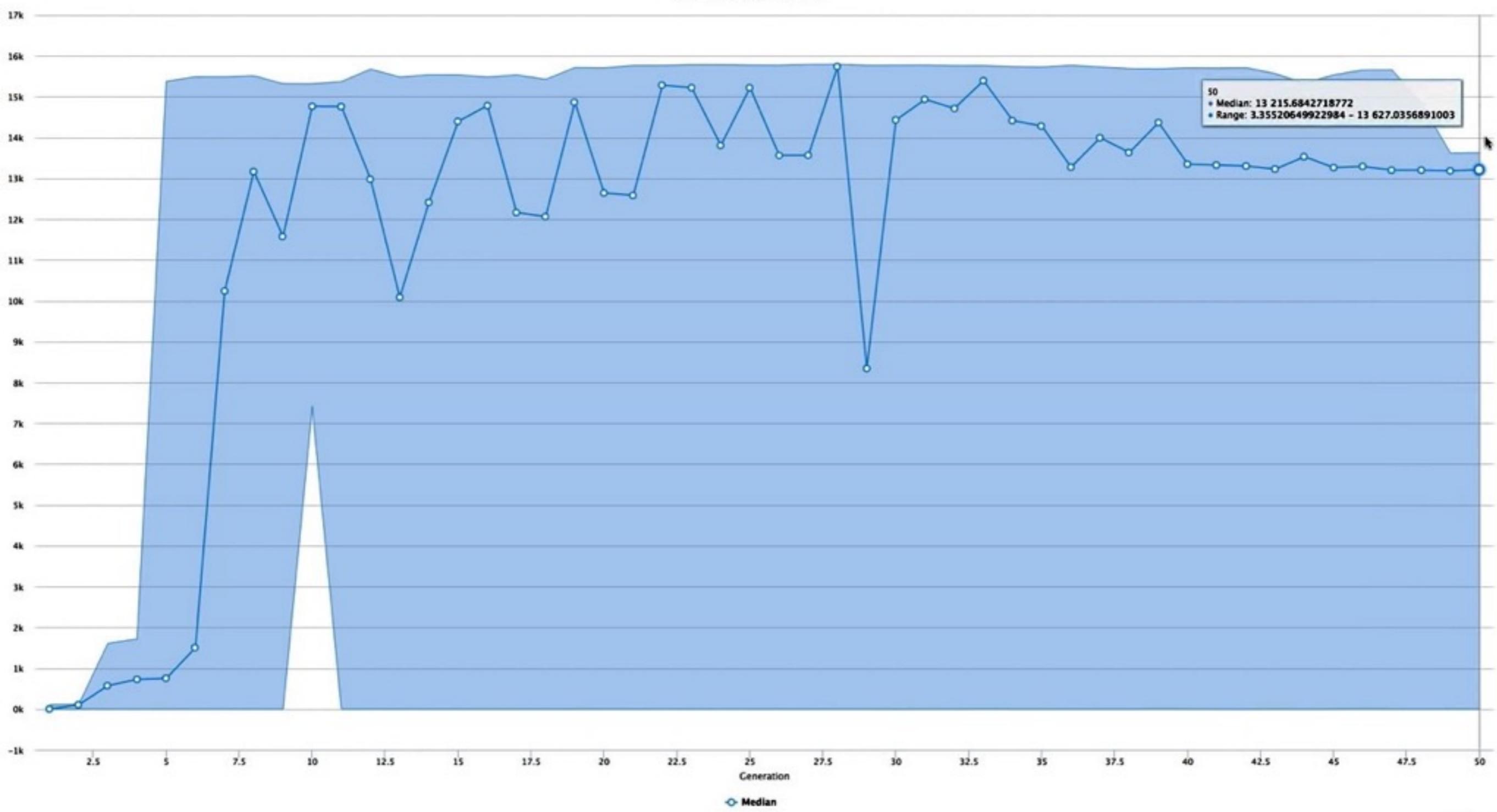
```
12 until chromosomes:length = size {
13     local t_mul is 0.75 + (random() * 0.5).
14     local t_exp is 0.75 + (random() * 0.5).
15     local t_off is 0.75 + (random() * 0.5).
16     local p_mul is -100 + (random() * 20).
17     local p_exp is 1 + (random() * 2).
18     local p_off is 80 + (random() * 20).
19     local cut is 90000 + (random() * 20000).
20
21     local chromosome is "".
22     set chromosome to chromosome + to_bitstring(t_mul).
23     set chromosome to chromosome + to_bitstring(t_exp).
24     set chromosome to chromosome + to_bitstring(t_off).
25     set chromosome to chromosome + to_bitstring(p_mul).
26     set chromosome to chromosome + to_bitstring(p_exp).
27     set chromosome to chromosome + to_bitstring(p_off).
28     set chromosome to chromosome + to_bitstring(cut).
29
30     chromosomes:add(chromosome).
31 }
```

```
18 // Penalty score
17 local alt_score is min(ship:apoapsis / 100
16
15 // Real scores
14 local ap_score is gaussian(ship:apoapsis,
13 local ec_score is gaussian(obt:eccentricit
12 local fl_score is gaussian(fuel:amount / f
11
10 local total is 0.
9 set total to total + ap_score * 10.
8 set total to total + ec_score * 5.
7 set total to total + fl_score.
6
5 // Scale total based on penalty
4 set total to total / max(1 - alt_score, 0.
3
2 return total.
1 }
```



Generation 1

KSP Generation Scores





But Why???

A rocket launching from a launch pad, with a large plume of smoke and fire at the base.

Thank You!

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