A Pilot's Perspective on Arrival Noise

Captain Jonathan Bonds

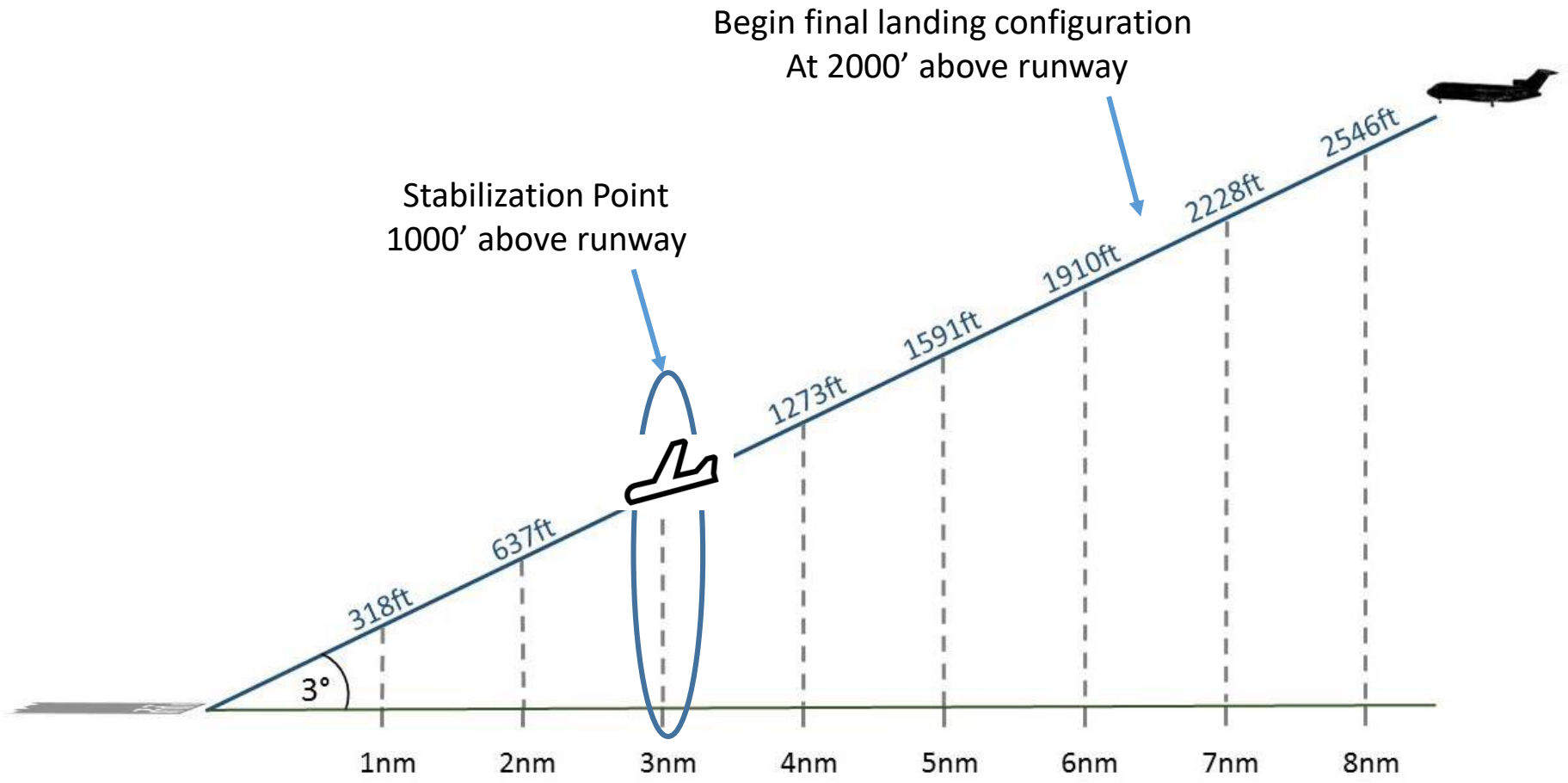
A Pilot's Perspective on Arrival Noise

a focus on the vertical path or descent angle

Will review:

- 3.0° approach considerations
  - 1000' stabilization requirement
  - High energy state
- The 3.2° approach
  - Heathrow & Frankfurt
- Greater than 3.2°
- Opportunities

Aircraft on a 3° Approach



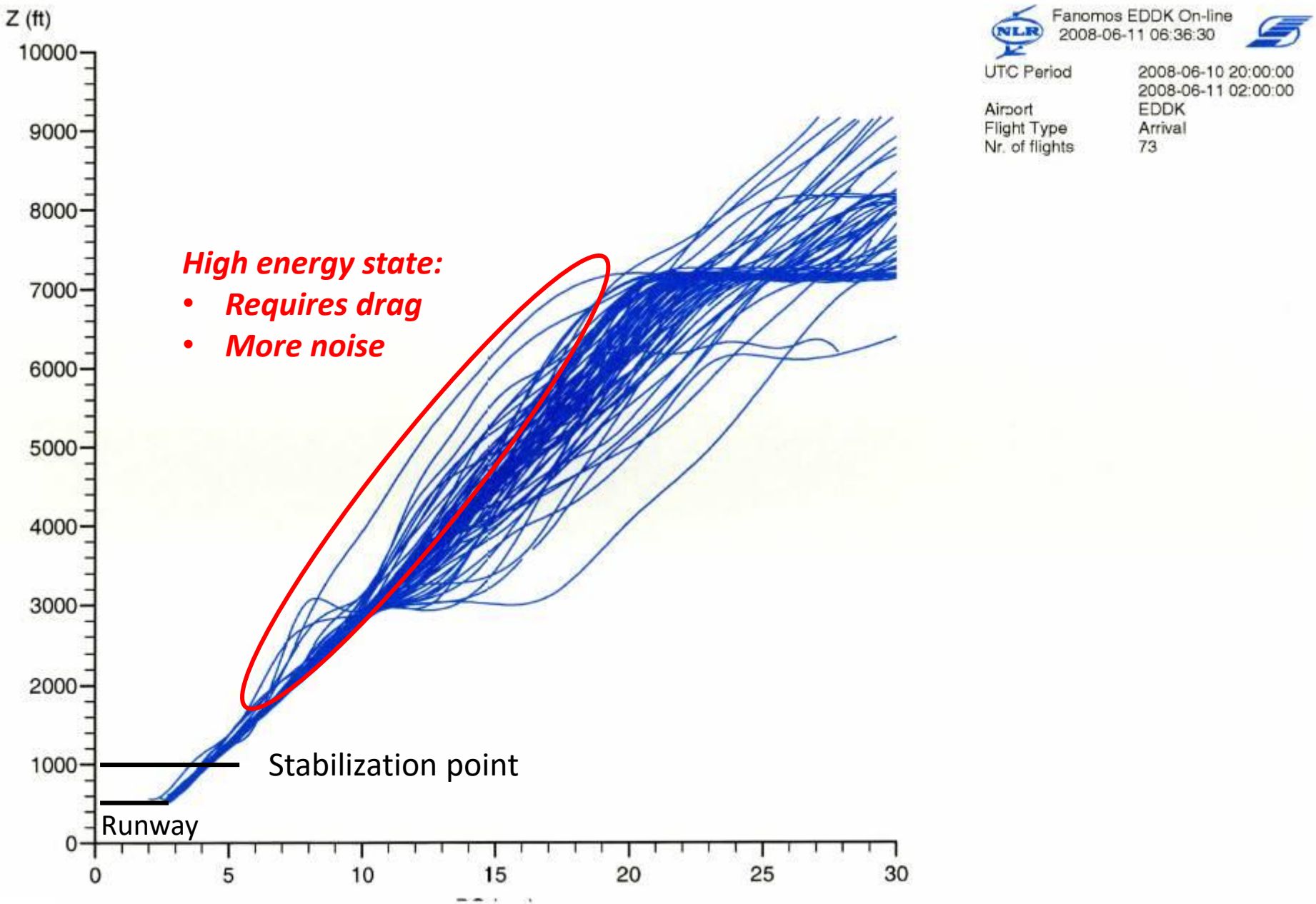
Aircraft Approach Stabilization: 1000’

A pilot’s goal is to be stabilized at 1000’ above the runway’s touchdown zone, with:

- Established on vertical path: not high or low
- Aircraft in the landing configuration: gear & flaps set
- Established on approach speed
- Power set

Unstable approaches can lead to landing accidents

- Airline Safety Programs monitor all approaches



Fanomos EDDK On-line
2008-06-11 06:36:30

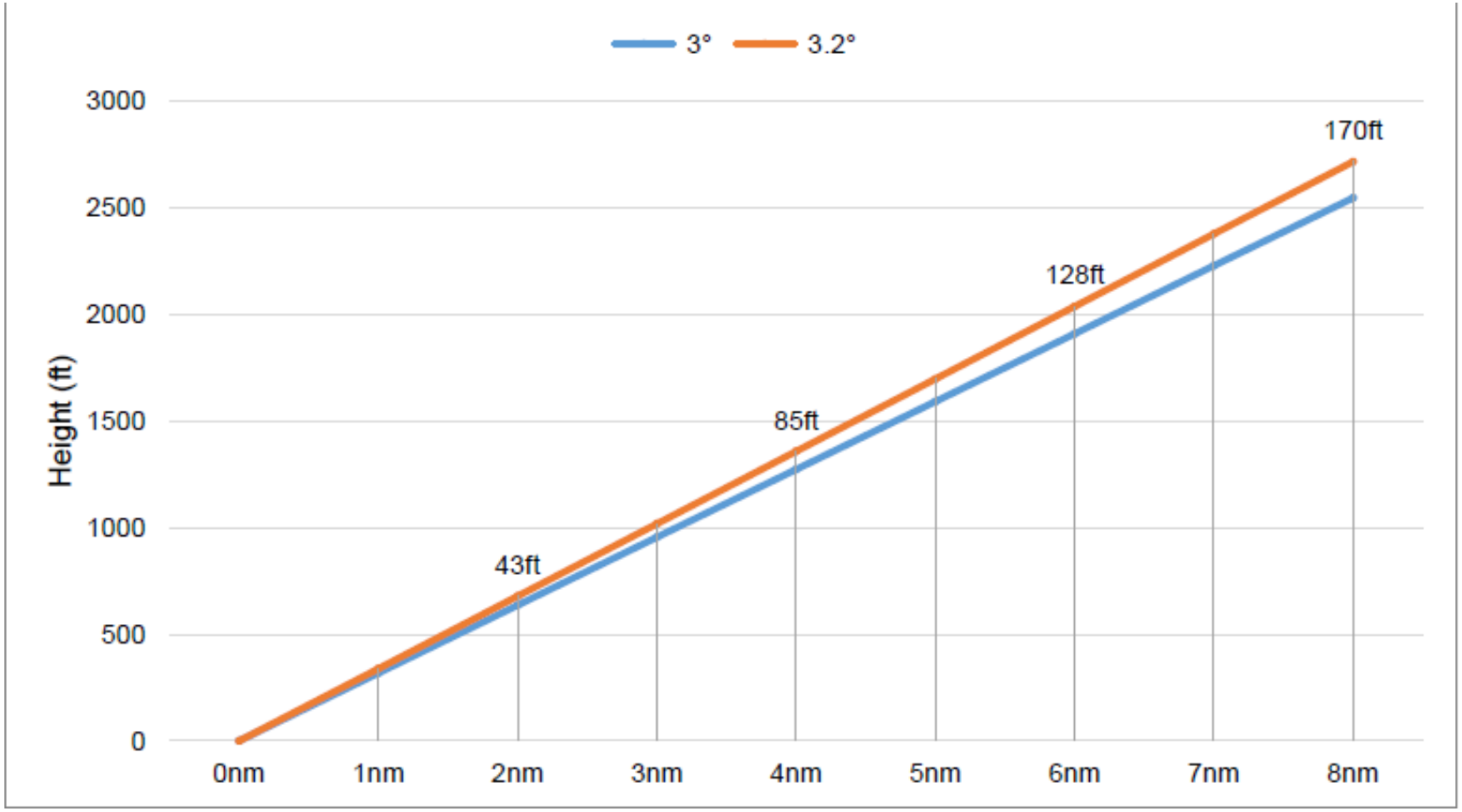
UTC Period	2008-06-10 20:00:00
	2008-06-11 02:00:00
Airport	EDDK
Flight Type	Arrival
Nr. of flights	73

If High or Fast, pilot may begin landing configuration early and/or use Speedbrakes

- Speedbrakes spoil lift by adding drag = up to a additional 6db (observed)

The 3.2°Approach: *aka Slightly Steeper*

Aircraft Height Comparison: 3.0° vs 3.2°
3.2° = approximately 20’ per nautical mile higher



3.2° Approach Operations: Frankfurt & Heathrow

- Noise benefit: reduced thrust & slightly higher
- Frankfurt has 8 runway ends, with one 3.2°
  - ILS Runway 25R
    - 25R also has a 3.0° ILS to support low visibility operations (less than 1800’ visibility)
      - Aircraft autopilot – autoland limitations are typically less than 3.2°
    - Slightly steeper benefit terminates 14nm from runway
- Heathrow has 4 runway ends: in trial
  - Each runway has an RNAV (GPS) approach with a 3.2° glide path
    - Slightly steeper benefit terminates 10nm from runway
  - ILS approaches are 3°

3.2° Approach Operations: Frankfurt & Heathrow

Frankfurt & Heathrow Noise Results:

- Predominantly wide-body & single-isle aircraft
- Average noise reduction .7db*
- Max 1.4db* reductions at approximately 8nm
  - A380
- No operational challenges, other than low visibility
  - Arrival rates
  - Stabilization
    - Note: Heathrow Study acknowledges fewer pilots accepted 3.2° with a tailwind

** ref: observed noise: Heathrow Slightly Steeper Approach Trial, August 2016*

Approaches greater than 3.2° for noise: Steep Approach

- 3.0° is the historical standard
  - ICAO PAN OPS adopted 3.0° as the standard in 1978

- Greater than 3.0° approaches
  - Designed or envisioned for terrain separation
    - Van Nuys & San Diego use 3.5°
  - Requires higher weather minima: approximately ¾ miles vs ½
  - No large flight trials above 3.2°
    - Demonstrations Studies only

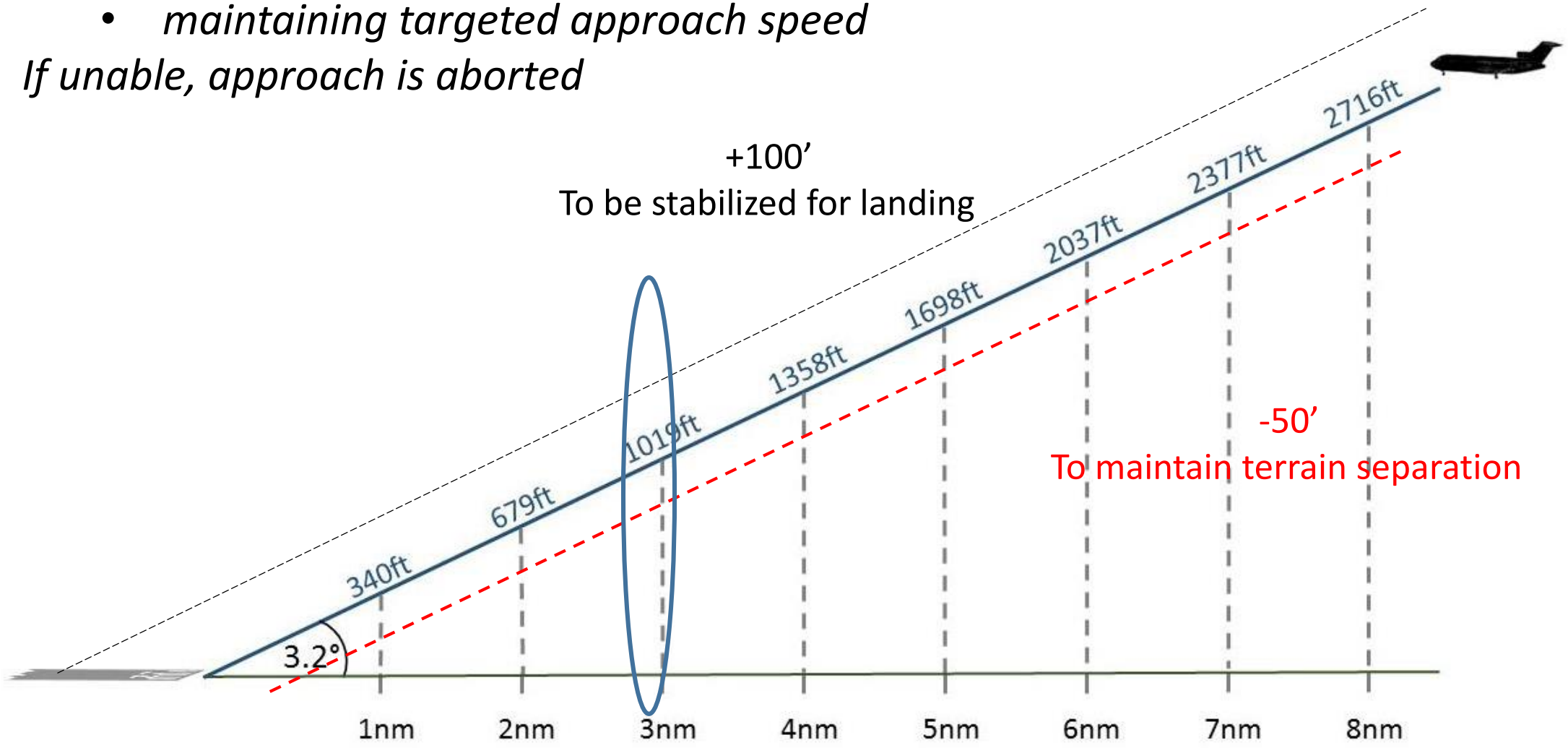
Approaches greater than 3.2° for noise: Steep Approach

- Large aircraft are currently limited to 3.5°
  - Large Aircraft's approach speeds are higher, increasing descent rates
  - Greater than 3.5° requires special crew training & possibly equipment modification

- Vertical Path Containment is the challenge, with steeper path
    - Autopilot will trade speed (accelerate) to maintain vertical path
      - Pilots will add drag - noise to maintain speed
        - Offsetting steeper benefit

Vertical Path Containment on Final: RNAV (GPS or RNP)

- *Aircraft must maintain vertical path +100’/-50’*
  - *maintaining targeted approach speed*
- *If unable, approach is aborted*



Arrival Opportunities

- What will the airspace support?
  - Factors affecting arrival noise
    - Arrival vs Departure de-confliction
    - Parallel and Converging Runway Operations
    - Terrain
    - Adjacent Airports & transient aircraft
- Minimize level flight segments below 6000’
  - Every 1000’ provides an additional 3nm of idle/near engine idle descent
- Design procedures to manage energy/noise: ATC or PBN
  - Noise efficient speeds
  - Minimize use of speedbrakes or high speed configuration below 6000’
    - Allow pilots to solve the energy equation at higher altitude

Questions??