

9. Performance & Limits

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9.1 Objective

This chapter provides a structured understanding of the Airbus A320 performance fundamentals and operational limits required for safe and efficient flight operations.

It is not intended to replace real-world performance manuals, but to give pilots the necessary knowledge to:

- Understand key speeds
- Operate within safe limits
- Maintain stable and predictable aircraft behavior

9.2 Takeoff Performance

V-Speeds Explained

Before every departure, three critical speeds must be calculated and inserted into the MCDU:

V1 – Decision Speed

- The maximum speed at which a rejected takeoff can be safely initiated
 - After passing V1, the takeoff **must be continued**, even in case of failure
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VR – Rotation Speed

- The speed at which the pilot initiates aircraft rotation
 - Smooth and controlled pitch input is required
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V2 – Takeoff Safety Speed

- Minimum safe climb speed after liftoff
 - Ensures sufficient climb performance in case of engine failure
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Operational Importance

Incorrect V-speeds can lead to:

- Unsafe takeoff performance
 - Runway overruns
 - Insufficient climb capability
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Core Rule

“Takeoff performance is calculated - never estimated.”

9.3 Approach & Landing Speeds

VAPP – Final Approach Speed

VAPP is the target speed during final approach.

It includes:

- Reference landing speed (VLS)
 - Wind correction
 - Safety margin
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Stability Requirement

Maintaining VAPP ensures:

- Stable descent
 - Predictable aircraft response
 - Safe landing performance
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Operational Note

Excessive speed leads to:

- Long landing distance
- Unstable flare

Too low speed leads to:

- Reduced lift
- Increased stall risk

Core Rule

“A stable approach requires a stable speed.”

9.4 Flap Configuration & Limits

The Airbus A320 uses multiple flap configurations to adapt to different flight phases.

Flap Settings Overview

- Flaps 1 → Initial configuration
 - Flaps 2 → Approach phase (GS intercept SOP)
 - Flaps 3 → Intermediate landing config
 - Flaps FULL → Final landing configuration
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Speed Limits (Typical)

- Flaps 1 → max ~230 kt
 - Flaps 2 → max ~200 kt
 - Flaps 3 → max ~185 kt
 - Flaps FULL → max ~177 kt
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Operational Importance

Exceeding flap limits may cause:

- Structural damage
 - System warnings
 - Loss of control margin
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Core Rule

“Configuration must always match speed.”

9.5 Taxi Speed Limits

Taxi speed is critical for:

- Safety
 - Passenger comfort
 - Ground operations
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Standard Taxi Speeds

- Normal taxi → approx. **20 kt**
 - Outside apron → max **30 kt**
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Special Cases

- High-speed exit → **40 kt (max 50 kt)**
 - Tight turns → max **15 kt**
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Operational Importance

Excessive taxi speed increases:

- Brake wear
 - Risk of runway/taxiway excursions
 - Passenger discomfort
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Core Rule

“Taxi speed must always match environment.”

9.6 Cruise Performance

Typical Cruise Envelope

- Altitude: **FL320 - FL390**
 - Speed: **Mach 0.76 - 0.80**
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Efficiency Considerations

- Higher altitude → lower fuel burn
 - Managed speed → optimal performance
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Monitoring Requirements

Pilots must monitor:

- Fuel consumption
 - Wind conditions
 - Flight progress
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Core Rule

“Cruise is about efficiency, not speed.”

9.7 Descent Performance & Energy Management

Descent Characteristics

- Typically flown at idle thrust
 - Vertical path controlled manually (VA SOP)
 - Speed managed automatically
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Energy State Awareness

Pilots must continuously assess:

- Altitude vs distance
 - Speed vs configuration
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High Energy Situation

- Too fast / too high

Correction methods:

- Increase descent rate
 - Use speed brakes
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Low Energy Situation

- Too slow / too low

Correction methods:

- Reduce descent rate
 - Increase thrust
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Core Rule

“Energy must be managed early - not corrected late.”

9.8 Operational Limits

Pilots must always respect:

- Speed limits (including flap limits)
 - Aircraft configuration limits
 - Stabilized approach criteria
 - ATC restrictions
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Importance

Limits are not recommendations – they define:

- Structural safety
 - Aircraft performance
 - Operational boundaries
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Core Rule

“Limits are absolute - not optional.”

9.9 Stabilized Approach as Performance Factor

A stabilized approach is the final expression of correct performance management.

Requirements

- Correct speed (VAPP)
 - Correct configuration
 - Correct descent profile
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Outcome

If performance is managed correctly:

- Aircraft arrives stable
 - Landing becomes predictable
 - Workload is reduced
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Core Rule

“A good landing starts with good performance management.”

9.10 Summary

Performance management in the A320 is based on:

- Proper planning
- Correct speed usage
- Respecting aircraft limits
- Continuous monitoring

Final Principle

“Performance defines safety, efficiency and control.”