9. Performance & Limits

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

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

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

Stability Requirement

Maintaining VAPP ensures:

- Stable descent
- Predictable aircraft response
- Safe landing performance

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

Speed Limits (Typical)

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

Operational Importance

Exceeding flap limits may cause:

- Structural damage
- System warnings
- Loss of control margin

Core Rule

“Configuration must always match speed.”

9.5 Taxi Speed Limits

Taxi speed is critical for:

- Safety
- Passenger comfort
- Ground operations

Standard Taxi Speeds

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

Special Cases

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

Operational Importance

Excessive taxi speed increases:

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

Core Rule

“Taxi speed must always match environment.”

9.6 Cruise Performance

Typical Cruise Envelope

- Altitude: **FL320 – FL390**
- Speed: **Mach 0.76 – 0.80**

Efficiency Considerations

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

Monitoring Requirements

Pilots must monitor:

- Fuel consumption
- Wind conditions
- Flight progress

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

Energy State Awareness

Pilots must continuously assess:

- Altitude vs distance
- Speed vs configuration

High Energy Situation

- Too fast / too high

Correction methods:

- Increase descent rate
- Use speed brakes

Low Energy Situation

- Too slow / too low

Correction methods:

- Reduce descent rate
- Increase thrust

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

Importance

Limits are not recommendations – they define:

- Structural safety
- Aircraft performance
- Operational boundaries

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

Outcome

If performance is managed correctly:

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

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.”