Synthetic Vision Systems Eagle-Vail Flight Test

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Overview

- Purpose
- Displays
- Equipment
- Venue
- Operations

Purpose

- Test Synthetic Vision Systems (SVS) display concepts in terrain-challenged environment
  - Follow-on study to SVS Dallas-Fort Worth flight test
- Collect flight data for Crew Activity Tracking System (CATS) demonstration

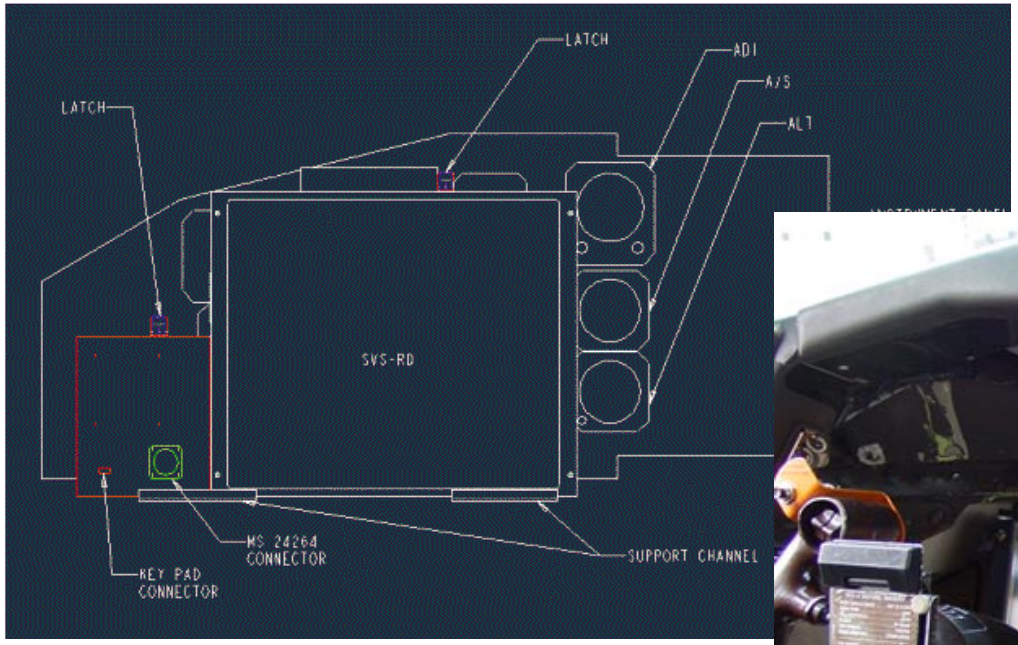
Equipment

- NASA B757 ARIES Aircraft
- Experimenter Pallets
- Removable research display (HDD)
- HUD system
- Data Acquisition System (DAS)

NASA B757 ARIES Aircraft

Experimenter Pallets

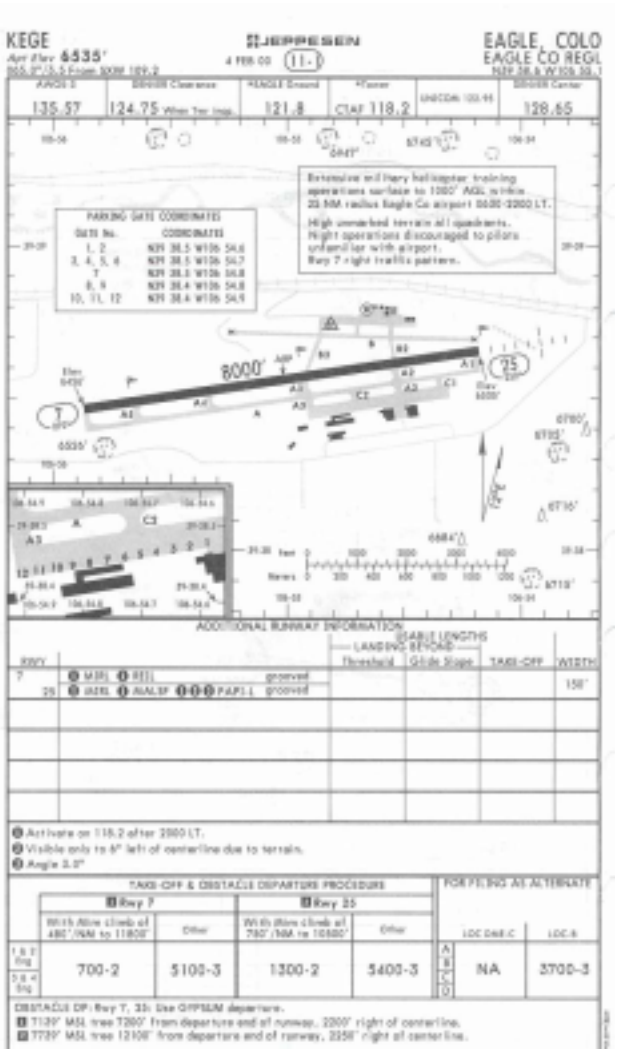
Removable Research Display



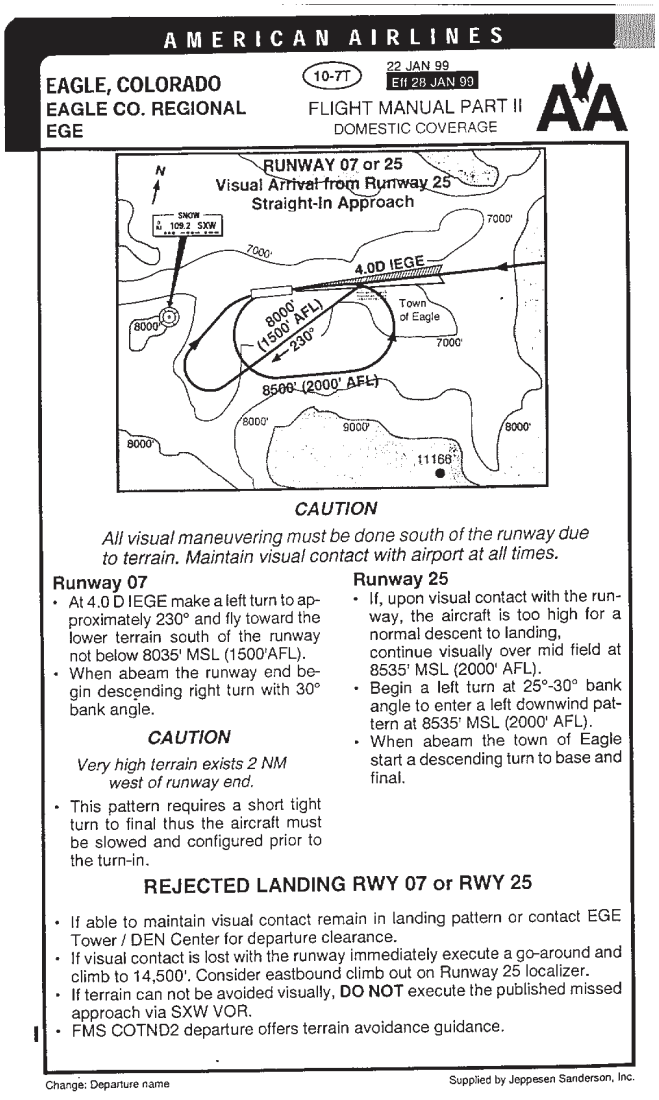
HUD System

Data Acquisition System (DAS)

Venue: Eagle County Regional Airport (KEGE)



KEGE Arrivals



AMERICAN AIRLINES

EAGLE, COLORADO
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EGE

10-7T
22 JAN 99
Eff 28 JAN 99

FLIGHT MANUAL PART II
DOMESTIC COVERAGE

RUNWAY 07 or 25
Visual Arrival from Runway 25
Straight-In Approach

SNOW 109.2 SXW
4.0D IEGE
8000' (1500' AFL)
230°
Town of Eagle
8500' (2000' AFL)
11166'

CAUTION

All visual maneuvering must be done south of the runway due to terrain. Maintain visual contact with airport at all times.

Runway 07

- At 4.0 D IEGE make a left turn to approximately 230° and fly toward the lower terrain south of the runway not below 8035' MSL (1500'AFL).
- When abeam the runway end begin descending right turn with 30° bank angle.

CAUTION

Very high terrain exists 2 NM west of runway end.

- This pattern requires a short tight turn to final thus the aircraft must be slowed and configured prior to the turn-in.

Runway 25

- If, upon visual contact with the runway, the aircraft is too high for a normal descent to landing, continue visually over mid field at 8535' MSL (2000' AFL).
- Begin a left turn at 25°-30° bank angle to enter a left downwind pattern at 8535' MSL (2000' AFL).
- When abeam the town of Eagle start a descending turn to base and final.

REJECTED LANDING RWY 07 or RWY 25

- If able to maintain visual contact remain in landing pattern or contact EGE Tower / DEN Center for departure clearance.
- If visual contact is lost with the runway immediately execute a go-around and climb to 14,500'. Consider eastbound climb out on Runway 25 localizer.
- If terrain can not be avoided visually, **DO NOT** execute the published missed approach via SXW VOR.
- FMS COTND2 departure offers terrain avoidance guidance.

Change: Departure name

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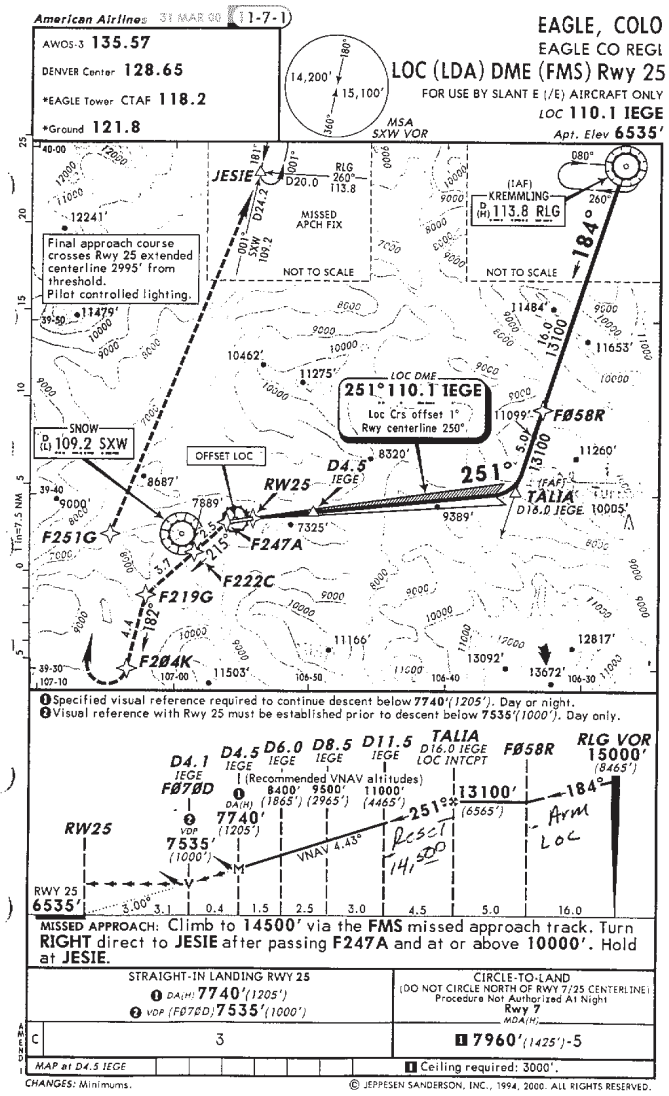

American Airlines 31 MAR 99 11-7-1

AWOS-3 135.57
DENVER Center 128.65
*EAGLE Tower CTAF 118.2
*Ground 121.8

EAGLE, COLO
EAGLE CO REGI
LOC (LDA) DME (FMS) Rwy 25
FOR USE BY SLANT E (/E) AIRCRAFT ONLY
LOC 110.1 IEGE
Apt. Elev 6535'

14,200' 15,100' MSA SXW VOR

JESIE D20.0 RLG 260° 113.8
MISSED APCH FIX
NOT TO SCALE
KREMMLING (IAF) D (H) 113.8 RLG
NOT TO SCALE
Final approach course crosses Rwy 25 extended centerline 2995' from threshold.
Pilot controlled lighting.
SNOW D (L) 109.2 SXW
OFFSET LOC
LOC DME 251° 110.1 IEGE
Loc Crs offset 1° Rwy centerline 250°.
RW25 D4.5 IEGE
251°
TALIA (FAF) D16.0 IEGE
FØ58R
184°
F251G F247A F222C F219G F2Ø4K

❶ Specified visual reference required to continue descent below 7740'(1205'). Day or night.
❷ Visual reference with Rwy 25 must be established prior to descent below 7535'(1000'). Day only.

D4.1 IEGE FØ7ØD D4.5 IEGE D6.0 IEGE D8.5 IEGE D11.5 IEGE TALIA D16.0 IEGE LOC INTCPT FØ58R RLG VOR 15000' (8465')
(Recommended VNAV altitudes) 8400' (1865') 9500' (2965') 11000' (4465') 13100' (6565')
❶ DA(H) 7740' (1205')
❷ VDP 7535' (1000')
VNAV 4.43°
RW25 RWY 25 6535'

MISSED APPROACH: Climb to **14500'** via the **FMS** missed approach track. Turn **RIGHT** direct to **JESIE** after passing **F247A** and at or above **10000'**. Hold at **JESIE**.

STRAIGHT-IN LANDING RWY 25	CIRCLE-TO-LAND (DO NOT CIRCLE NORTH OF RWY 7/25 CENTERLINE) Procedure Not Authorized At Night
❶ DA(H) 7740'(1205') ❷ VDP (FØ7ØD) 7535'(1000')	Rwy 7 MDA(H)
C 3	❶ 7960'(1425')-5
MAP at D4.5 IEGE	❶ Ceiling required: 3000'.

CHANGES: Minimums.

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KEGE Departures

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17 MAR 00 (10-7Y)

FLIGHT MANUAL PART II
DOMESTIC COVERAGE

EAGLE, COLORADO
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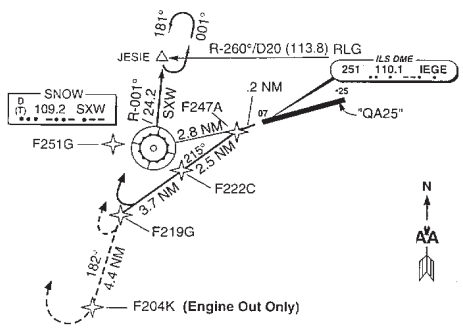
Takeoff Runway 25 - 757-200 Flaps 5°
FMS COTTONWOOD TWO DEPARTURE



General
- Verify EGE Runway 25 COTND2 Departure selected.
- After reaching the number one hold short position (where Taxiway A1 joins Runway 25) and within 3 minutes of takeoff, perform a Quick Align to gate position "QA25". Cross check map display for accuracy after NAV status is annunciated.
- Manually tune 110.45 on both Navs (inhibits update).
- Manually tune 110.10 IEGE LOC frequency. PNF select ILS on HSI mode control panel. PF select MAP mode.

Normal Departure
- At 0 DME IEGE LOC turn left to 215° track using a minimum 15° bank and arm LNAV.
- Maintain V2+15 with flaps 5° until 9235' MSL (2700' AFL). Set climb power. Accelerate and clean-up on schedule.
- At 10,000' MSL turn RIGHT direct JESIE, climb to assigned altitude. DEN Center expects turn prior to F219G.
- **FMC failure**: At 0 DME IEGE turn to 215° heading and climb to assigned altitude. After passing 10,000' MSL, proceed direct JESIE via the SXW R-001.

Engine Failure on Takeoff / Missed Approach Procedure.
Follow Normal Departure Procedure above except:
- At 9235' MSL (2700' AFL), clean-up on schedule, climb at Ref+80 to 14,000 MSL.
- At Ref + 80 select MCT.
- Fly published ground track to 10,000' MSL passing F219G, but no later than F204K, turn right direct JESIE. Continue climb to assigned altitude.

Change: Graphic

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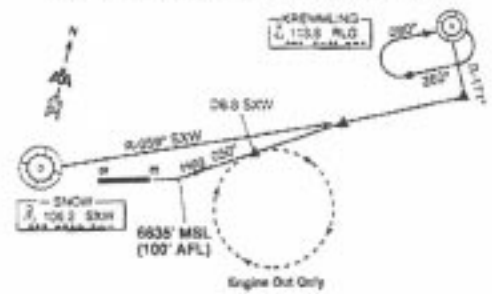
AA FLT OPS TECH

EAGLE, COLORADO
EAGLE CO. REGIONAL
EGE

(10-7X) 22 JAN 99

FLIGHT MANUAL PART II
DOMESTIC COVERAGE

EGE Takeoff Runway 07 - 757-200 Flaps 5°
KREMM DEPARTURE
Note: This is NOT a FMS Departure. Use raw data



Normal Departure
- At 6635' MSL (100' AFL) initiate climbing left turn to HDG 050°.
- Intercept SXW R-059° outbound.
- Maintain V2+15 with flaps 5° until 9235' MSL (2700' AFL).
- At 9235' MSL (2700' AFL), set climb power, clean-up on schedule, climb to 14,500' MSL or as assigned.
- Intercept RLG R-171° to RLG VOR, continue on assigned route at MEA or higher.

Engine Failure on Takeoff / Missed Approach Procedure.
Follow Normal Departure Procedure above except:

Prior to SXW D6.8
- Climb at V2 plus appropriate additives.
- At SXW D6.8 start climbing RIGHT 360° turn. Minimum aircraft climb gradient will provide an altitude of 7375' MSL (840' AFL) or better at start of turn. Use heading select, bank limiter 15° and takeoff power.
- At 9235' MSL (2700' AFL), clean-up on schedule, climb at Ref+80 to 14,000 MSL.
- At completion of 360° turn, resume SID as depicted to intercept SXW R-059°.
- T.O. power limited to 5 minutes after brake release.

After SXW D6.8
- Follow normal departure profile.
- At 9235' MSL (2700' AFL), clean-up on schedule, climb at Ref+80 to 14,000 MSL.
- T.O. power limited to 5 minutes after brake release.

Change: See other side

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KEGE Techniques

AMERICAN AIRLINES

22 JAN 99 (10-7S)

FLIGHT MANUAL PART II
DOMESTIC COVERAGE

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EGE

ARRIVAL

CAUTION

Taxiway C-2 ramp entry offers minimum clearance. Follow taxi lines very closely.

Anticipate Turbulence on Approach
- Seat Flight Attendants prior to departing RLG.

Special Procedures
- Expect holding at RLG until airspace is clear. DEN Center will attempt to approve requests for holding pattern north of RLG.
- Consider canceling IFR to facilitate traffic flow. To cancel IFR you must:
  - be below 18,000' MSL.
  - be able to maintain VFR to the airport.
  - be in contact with EGE Tower.
  - have the runway in sight.

LANDING

spoilers Always!

- Use 30° flaps. Consider using autobrakes ~~and autospoilers~~.
- Plan touchdown 1000' from approach end.
- Tailwind limits: (Braking action must be GOOD or better)
  - Runway 25:10 kts maximum
  - Runway 07:5 kts maximum (DAY ONLY)
- Once firmly on the ground, **DO NOT** attempt a go-around.
- Last 1500' of runway may be slick.
- Runway slope: Runway 25 is -1% Runway 07 is +1%

PRIMARY APPROACH

LOC/DME (FMS) Rwy 25 "LDA25 / RLG Transition"
- See technique guide on page 11-6A.

Change: See other side

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(11-6A) 22 JAN 99

FLIGHT MANUAL PART II
DOMESTIC COVERAGE

KEGE LOC (LDA) DME (FMS)
Runway 25 Technique Guide - 757

Weather / Equipment requirements.
- Below 5000'/3, three IRUs and both FMCs required.
- One autopilot with HDG, ALT, V/S, LOC, LNAV and VNAV modes A/T in SPEED mode.

Autopilot and autothrottles recommended.

VNAV allows a steep (4.43°) but controlled approach.

In the event of loss of both FMCs during approach or missed approach, proceed via the IEGE LOC to 0 DME while climbing to 15,000'. At 0 DME turn left to 215° hdg until passing 10,000' MSL, then turn right to JESIE via the SXW 001° radial.

Prior to RLG (Kremmling VOR)
- Seat Flight Attendants
- Activate EGPWS terrain display.
- Select "LDA 25" RLG: transition from the FMC database.
- If holding required, request pattern north of RLG on the 004°R.
- Set radio altimeter DH to 500'. If RA alerts prior to DH execute Missed Approach.
- Set 7740' MSL as barometric DA(H).
- DO NOT make LEGS page modifications inside F058R. Control speed with speed intervention.

At RLG (15,000' MSL)
- One pilot should monitor VOR raw data on the lower screen while flying outbound on the RLG VOR 184°, then switch to IEGE LOC prior to TALIA to monitor ILS DME.
- If in VNAV PATH reset MCP to 7800' prior to leveling at 13,100' MSL.
- If not in VNAV PATH, descend to 13,100' MSL using any Flt Dir mode. When level at 13,100' MSL and past F058R, set MCP to 7800' and select VNAV.
- Monitor VNAV error on DES page.
- Manage speed to arrive at TALIA at 140 kts in landing configuration.

At F058R (D16.0 RLG)
- Arm LOC prior to TALIA.

At TALIA (D16.0 IEGE)
- Ensure LOC is captured and descent from 13,100' in VNAV PATH begins.
- At D11.5 IEGE verify ~~crossing altitude 11,900'~~ MSL - then reset MCP to 14,500' for missed ~~approach altitude~~.
- Monitor LNAV and VNAV indications. If VNAV PATH is lost and airport is not in sight, stop descent and execute LNAV missed approach.
- The Localizer is the controling NAVAID for this approach. If Localizer signal is lost prior to visual contact, execute a Missed Approach.

At 7740' MSL (1205' AFL) **DA (H)**
- Required parameters
  - Stabilized approach
  - HSI V-PATH within 100'
  - LOC deviation within 1/3 dot
  - Visual contact must be established with road, river and/or railroad track (page 10-7W).
  - NIGHT: MIRL / MALSF / PAPPI lights in sight.

At 7535' MSL (1000' AFL)
(Visual Descent Point)
- Fly visually to landing with A/P off. Use VNAV as reference only.
- If unable, immediately execute LNAV missed approach **(2 engine flaps 20°, single engine flaps 5°)** climbing to 14,500' MSL.
  - Accelerate and retract flaps above 9235' MSL (2700' AFL).

Change: Editorial

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Rwy25 Overflight

Circle to Rwy7

Over the Rockies

Jump Seat Boy