Flight Procedures Cover Page	Task Action: FLIGHT CHECK	Task Type: STAR	Estimated Chart Date: 04/17/2025	APWS Task ID: 79CE2BBC4DF543C3818539C8F485FD27	APWS Project ID: 6C2619CF6CF84FD1AC52555C00E283FE
Procedure: STAR ZOMBZ SIX (RNAV) DENVER CO KAPA		Enroute: YES	Specialist: Hilley, Dustin		Agreement Number:
Airport ID: KAPA			Airport City: DENVER		State: CO
Facility ID:	Facility Type:	Flight Inspection Remark Type: New FC Slot			

Procedure Comments:
ACTIVE DATA USED.

ADDING NEW TRANSITIONS FOR DENVER TERMINAL AREA TO ASSIST WITH AIRCRAFT REROUTING.

WAIVERS
1 AIRSPEED REDUCTION
1 ROC REDUCTION

APPROVALS
1 DESCENT GRADIANT

CONTACT RAKE MCGRAW, AJV-A422 (405) 954-8711

02/07/25: THIS IS AN UPDATED COPY OF THE FORM DEVELOPED ON 11/13/24.
1. ADDED REMARK: "XPATH TO XBEEE: AS 1000 IS USED IN THIS SECTION; THE FLOOR OF CONTROLLED AIRSPACE IN THIS SECTION IS 1200 FOR AN AIRSPACE ADJUSTMENT OF 1500 FT (TERRAIN 7700 + 1500 = 9200) – ADDITIONAL AIRSPACE REQUIRED"

QUALITY 16 CHECKED

QUALITY 38 CHECKED

QUALITY 35 CHECKED

Data as of: 12/05/2024 11:01:37 CST

FIPC DME/DME FORM

PROCEDURE:	AIRPORT NAME:	AIRPORT ID:	SPECIAL CONTROL NO:
STAR ZOMBZ SIX (RNAV) DENVER CO KAPA	CENTENNIAL	KAPA	SG-01-031-25

FAC ID: ZOMBZ6	CITY: DENVER	ST: CO	ORIG CHART DATE: 04/17/2025

DFL TYPE:	THIRD PARTY:	EST. TIME ON SITE:	REIMB. NUMBER:	PTS TASK ID:
PROC/D	☐ YES	1.0		79CE2BBC4DF543C3818539C8F485FD27

PREFLIGHT NOTES

REVIEWER: joel p murphy

DATE: 02/05/2025

COMMENTS:

CHECK ONE:
☒ FLT CK REQ ☐ NFCR ☐ REJECT

	YES	NO
CPV COMPLETE?	X	

PROCEDURE RESULTS

INSPECTION DATE:	CREW #:	N #:	INSTRUMENT PROCEDURE STATUS:	ARINC CODING:
02/05/2025	VN451	N87	☒ SAT ☐ SAT W/CHANGES ☐ UNSAT	☒ SAT ☐ SAT/GOLD ☐ UNSAT

FLIGHT INSPECTOR SIGNATURE:	PRINTED NAME:	NOTAM INITIATED?
joel p murphy @ 02/05/2025 16:00	MURPHY, JOEL PATRICK	☐ YES ☒ NO

FLIGHT INSPECTOR REMARKS:
Procedure Satisfactory for GNSS operations, DME/ DME awaiting AFS/ WAJR approval.

DME/DME STATUS:	SPECIALIST SIGNATURE:	PRINTED NAME:
☒ SAT ☐ UNSAT	jeanette ctr roller @ 02/10/2025 14:52	Jeanette Roller

SPECIALIST REMARKS:
DME/DME received as modeled.

IN-FLIGHT OBSTACLE REPORT

OBSTRUCTION ID #:	COORDINATES OR LOCATION:	GNSS ALTITUDE (MSL):	BAROMETRIC ALTITUDE (MSL):	HEIGHT ABOVE GROUND LEVEL:

FIPC DME/DME FORM

PROCEDURE:	AIRPORT NAME:	AIRPORT ID:	SPECIAL CONTROL NO:
STAR ZOMBZ SIX (RNAV) DENVER CO KAPA	CENTENNIAL	KAPA	SG-01-031-25

FAC ID: ZOMBZ6	CITY: DENVER	ST: CO	ORIG CHART DATE: 04/17/2025

DFL TYPE:	THIRD PARTY:	EST. TIME ON SITE:	REIMB. NUMBER:	PTS TASK ID:
PROC/D	☐ YES	1.0		79CE2BBC4DF543C3818539C8F485FD27

PREFLIGHT NOTES

REVIEWER: joel p murphy

DATE: 02/05/2025

COMMENTS:

CHECK ONE:
☒ FLT CK REQ ☐ NFCR ☐ REJECT

	YES	NO
CPV COMPLETE?	X	

PROCEDURE RESULTS

INSPECTION DATE:	CREW #:	N #:	INSTRUMENT PROCEDURE STATUS:	ARINC CODING:
02/05/2025	VN451	N87	☒ SAT ☐ SAT W/CHANGES ☐ UNSAT	☒ SAT ☐ SAT/GOLD ☐ UNSAT

FLIGHT INSPECTOR SIGNATURE:	PRINTED NAME:	NOTAM INITIATED?
joel p murphy @ 02/05/2025 16:00	MURPHY, JOEL PATRICK	☐ YES ☒ NO

FLIGHT INSPECTOR REMARKS:
Procedure Satisfactory for GNSS operations, DME/ DME awaiting AFS/ WAJR approval.

DME/DME STATUS:	SPECIALIST SIGNATURE:	PRINTED NAME:
☐ SAT ☐ UNSAT		

SPECIALIST REMARKS:

IN-FLIGHT OBSTACLE REPORT

OBSTRUCTION ID #:	COORDINATES OR LOCATION:	GNSS ALTITUDE (MSL):	BAROMETRIC ALTITUDE (MSL):	HEIGHT ABOVE GROUND LEVEL:

US Department of Transportation
Federal Aviation Administration

FLIGHT PROCEDURE STANDARDS WAIVER

FLIGHT STANDARDS USE ONLY
CONTROL NO.

1. FLIGHT PROCEDURE IDENTIFICATION:

Centennial, CO
Centennial Airport (KAPA)
ZOMBZ (RNAV) STAR

2. WAIVER REQUIRED AND APPLICABLE STANDARD:

FAA Order 8260.58C, paragraph 1-2-5, Table 1-2-2, Indicated Airspeeds (KIAS):
Reflects 250 KIAS is the appropriate airspeed for Category B aircraft AT or ABOVE 10,000 feet.
Note 3 states, 250 KTS AT or ABOVE 10,000 feet MSL except for initial and/or STAR termination fix.
Note 2 states, airspeed restrictions may be established at a charted fix to reduce turn radius, avoid obstacles accommodate ATC request, etc...

3. REASON FOR WAIVER (JUSTIFICATION FOR NONSTANDARD TREATMENT):

There is an ATC operational requirement on the ZOMBZ STAR to have aircraft cross XBEEE at 9,000 feet MSL and at or below 240kts. XBEEE waypoint is the terminus point on the STAR and serves as the Initial Approach Fix for both the ILS and RNAV GPS approach to Runway 35R at KAPA. Aircraft landing at KAPA must descend after crossing XJOIN at 12000ft and at 240kts in order to meet the restrictions at XBEEE for the transitions to the approaches and to be at an acceptable and manageable speed for sequencing. Landing KCFO, aircraft must descend to cross DORLE at 12000ft and at 230 kts, then cross SEESU at 11000ft and at 210kts. The field elevation at KCFO is 5515 MSL, therefore, aircraft at 11000 MSL are 5,485 AGL while transitioning to the approaches.

4. EQUIVALENT LEVEL OF SAFETY PROVIDED:

The ZOMBZ STAR was designed with Industry input and has their endorsement.

5. ALTERNATIVE ACTIONS DEEMED NOT FEASIBLE:

Alternatives were considered, however none were feasible due to the KAPA field elevation and the glideslope intercept altitude on the Instrument Approaches. Another factor is the need for slower airspeeds when transitioning to the Instrument Approaches and in order for ATC to safely sequence aircraft entering the terminal environment in order for ATC to safely sequence aircraft at KAPA.

6. COORDINATION WITH USER ORGANIZATIONS (SPECIFY):

Denver ARTCC
Denver Approach Control
WSC OSG

7. SUBMITTED BY:

DATE	OFFICE IDENTIFICATION	TITLE	SIGNATURE
11/22/24	AJV-A43	Manager	Beverly Bordy

Digitally signed by
RAKE MCGRAW
Dec 30, 2024

8. AFS ACTIONS:

☐ **APPROVED** ☐ **DISAPPROVED** ☐ **NOT REQUIRED**

COMMENTS:

DATE	ROUTING SYMBOL	SIGNATURE

1. FLIGHT PROCEDURE IDENTIFICATION:

Denver, CO
Centennial Airport (KAPA)
ZOMBZ (RNAV) STAR

2. WAIVER REQUIRED AND APPLICABLE STANDARD:

FAA Order 8260.3F paragraph 2-2-6, Obstacle Clearance, Chapter 14, paragraph 14-2-1 Obstacle Clearance, Primary Area b.(1): Reflects 2,000 feet of ROC must be applied to obstacles evaluated in the Primary Area that exist within the designated mountainous areas. Reflects ROC may be reduced to not less than 1,700 feet above terrain and vegetation in the designated mountainous areas of the Western United States.

3. REASON FOR WAIVER (JUSTIFICATION FOR NONSTANDARD TREATMENT):

There is an ATC operational requirement on the ZOMBZ STAR to have aircraft cross XPATH waypoint AT 10500 feet MSL specifically when landing on Runway 35R at KAPA. XBEEE waypoint is the terminus point on the STAR runway transition to 35R and serves as the Initial Approach Fix for both the ILS and RNAV GPS approaches to Runway 35R at KAPA. Aircraft landing on Runway 35R at KAPA must descend after crossing XPATH waypoint to this altitude so that ATC meets the requirement to maintain 1,000 feet vertical separation from KDEN arrivals and departures that cross above at 10,000 feet MSL.
KAPA airport is located within the Western Mountainous Area designated under 14 CFR Part 95 Subpart B. FAA Order 8260.3F, paragraph 2-2-6, Obstacle Clearance, Chapter 14, paragraph 14-2-1.b states that 2,000 feet of ROC must be applied to obstacles evaluated in mountainous areas within the Primary Area of the OEA. Paragraph 14-2-1.b(1) states that ROC may be reduced to not less than 1,700 feet above terrain and vegetation in the designated mountainous areas of the Western United States. Paragraph 14-2-1.b(2) states that where reduced ROC is applied as described in paragraph 14-2-1.b(1), altitudes providing at least 1,000 feet of ROC over towers and/or other manmade obstacles/MO are authorized.
When evaluated against criteria, the segment of the ZOMBZ STAR, XPATH to XBEEE waypoint, has a controlling obstacle (terrain) with a height of 7907 feet MSL. Applying 2,000 feet of ROC and 200 feet for AAO, the minimum crossing restriction at XBEEE waypoint would have to be raised to 10000 feet MSL. Taking terrain (7907 feet MSL) and vegetation (100 feet) into consideration, the amount of reduced ROC needed for this segment to comply with the ATC operational crossing restriction, XBEEE waypoint AT 9000 feet MSL, is 1000 feet. By Adjusting the reduced ROC for this leg segment to achieve AT 9,000 feet MSL crossing restriction at XBEEE waypoint would adhere to paragraph 14-2-1.b(2) keeping aircraft at least 1,000 feet above the highest obstacle plus AAO is (8642). No precipitous terrain exists within the Primary or Secondary Areas of the OEA for this segment. Also, the terrain hit is behind the XBEEE and slightly in front of XPATH.

When evaluated against criteria, the segment of the ZOMBZ STAR, XJOIN to XPATH waypoint, has a controlling obstacle (terrain) with a height of 8642 feet MSL. Applying 2,000 feet of ROC and 200 feet for AAO, the minimum crossing restriction at XBEEE waypoint would have to be raised to 10642 feet MSL. Taking terrain (8642 feet MSL) and vegetation (100 feet) into consideration, the amount of reduced ROC needed for this segment to comply with the ATC operational crossing restriction, XPATH waypoint AT 10500 feet MSL, is 142 feet. Adjusting the reduced ROC for this leg segment, to achieve AT 9,000 feet MSL crossing restriction at XBEEE waypoint would adhere to paragraph 14-2-1.b(2) keeping aircraft at least 1,000 feet above the highest obstacle plus AAO is (8642).No precipitous terrain exists within the Primary or Secondary Areas of the OEA for this segment.

4. EQUIVALENT LEVEL OF SAFETY PROVIDED:

The ZOMBZ STAR was designed with Industry input and has their endorsement based on various aircraft flight simulator results. The leg segment XPATH waypoint to XBEEE waypoint is currently an approach procedure initial segment where only 1,000 feet of ROC is applied. Aircraft crossing XBEEE waypoint AT 9,000 feet MSL adheres to 8260.3F Paragraph 14-2-1.b(2) providing at least 1,000 feet of ROC over towers and/or other manmade obstacles/AAO. The highest manmade obstacle (6,833 feet MSL) or AAO (7,907 feet MSL) within the OEA for this leg segment, XPATH waypoint to XBEEE waypoint, allows for 1,201 feet of obstacle clearance above manmade/AAO obstacles.
An evaluation for this leg segment was completed within 10NM of all segment terrain points above 6,800 feet MSL. The greatest terrain elevation difference from any of these points is 2,944 feet. Based on ICAO definition of mountainous terrain (>3,000 feet elevation difference within 10NM). All terrain points that would drive a segment altitude AT 9,000 feet, after 200 feet AAO and 2,000 feet ROC is applied, would not be classified as mountainous and would only require 1,000 feet ROC. Any areas of precipitous terrain within 10NM of this leg segment OEA are a minimum 4NM behind the aircraft at the point it descends below 2,000 feet ROC.

5. ALTERNATIVE ACTIONS DEEMED NOT FEASIBLE:

Alternatives were considered to build the segment XJOIN-XPATH-XBEEE, however none were feasible due to the field elevation of KAPA and the arrival interactions with KDEN arrival and departure traffic. The current ZOMBZ STAR runway transition to 35R ends at XBEEE
waypoint, where XBEEE is a Fly-By waypoint. XBEEE waypoint also serves as the Initial Approach Fix for both the ILS and RNAV GPS approaches to KAPA Runway 35R. If ATC does not clear aircraft for either the ILS or RNAV GPS approach to KAPA Runway 35R in a timely manner from the ZOMBZ STAR, it is possible for aircraft to continue flying on ATC assigned heading to the West. When this occurs, it creates additional workload for ATC and becomes a safety issue due to rising terrain and MVAs to the West.
It was determined that XBEEE is required to cross at 9,000 feet MSL to ensure a sufficient level of safety within Denver Approach Control's airspace. Raising the crossing restriction to 10,000 feet MSL would not be feasible as KDEN arrival and departure traffic, depending on the airport configuration, are already at that altitude. Raising the KDEN arrival traffic to accommodate would result in aircraft intercepting the final above the glide path altitude on the approaches.

6. COORDINATION WITH USER ORGANIZATIONS (SPECIFY):

7. SUBMITTED BY:

DATE	OFFICE IDENTIFICATION	TITLE	SIGNATURE
11/22/24	AJV-A43	Manager	Beverly Bordy *Digitally signed by* ***RAKE MCGRAW*** Dec 30, 2024

8. AFS ACTIONS:

☐ **APPROVED** ☐ **DISAPPROVED** ☐ **NOT REQUIRED**

COMMENTS:

DATE	ROUTING SYMBOL	SIGNATURE

Federal Aviation Administration

Memorandum

Date: 12/04/2024

To: Manager, Flight Procedures Standards

From: Bev Bordy, Manager, Instrument Flight Procedures (IFP), AJV-A43

Subject: Approval Request: Centennial, Denver, CO (KAPA)
STAR ZOMBZ (RNAV) SIX

Request is for approval for a descent gradient of 347 ft/Nautical Mile (NM), or 3.27 degrees from XPATH Waypoint to XBEEE Waypoint, a vertical loss of 1500 ft in 4.32 NM.

The requirement in Order 8260.3F, paragraph 2-2-8.a (3) is:
(3) When a STAR contains a descent between fixes that passes through 10000 feet MSL, the maximum permissible DG is between 318 ft/NM and 330 ft/NM and is in proportion to the amount of the altitude change that is below/above 10000 feet MSL. Use formula 2-2-1 to determine the maximum DG (DGmax) between fixes that contain a descent that passes through 10000 feet MSL.

The Descent Gradient of 322 ft/NM from XPATH to XBEEE was calculated based on the altitude restrictions of 10500 at XPATH and 9000 at XBEEE, over a distance of 4.32 NM.

There is an operational need to have the ZOMBZ STAR operate between the altitudes designed into the procedure because of high terrain prior to XPATH waypoint and KDEN arriving and departing traffic after XBEEE waypoint. The leg segment from XPATH to XBEEE was part of the ILS RWY 35R and RNAV GPS RWY 35R approaches with these same restrictions. ATC safety concern with aircraft missing the turn after XPATH to fly the approach has required us to add this leg segment to the ZOMBZ STAR and remove it from the approaches. This request is lowering a previously approved descent gradient approval request for ZOMBZ (RNAV) FOUR KAPA, Denver, CO.

(ZOMBZ.ZOMBZ6) FIG

ZOMBZ SIX ARRIVAL (RNAV)

AL-5715 (FAA)

DENVER, COLORADO

ZOMBZ SIX ARRIVAL (RNAV)

DENVER, COLORADO

(ZOMBZ.ZOMBZ6) FIG

AUTOMATED AL-5715 ZOMBZ ARRIVAL

SW-1

12-30-24

COMPILER: JUN

REVIEWER:

DBL CHKR:

EFF DATE: FIG

ARRIVAL ROUTE DESCRIPTION

LAMOE TRANSITION (LAMOE.ZOMBZ6)
STIFS TRANSITION (STIFS.ZOMBZ6)

LANDING KAPA RUNWAY 17L: From ZOMBZ on track 081° to cross XBOXX between 13000 and 14000, then on track 041° to cross GOULD at or above 12000, then on track 041 to cross XNICE at 11000, then on track 350° to cross XHOME at 11000, then on track 350° to cross NSYNC at 10000 and at 210K, then on track 350°. Expect RADAR vectors to final approach course.

LANDING KAPA RUNWAY 35R: From ZOMBZ on track 081° to cross XBOXX between 13000 and 14000, then on track 094° to cross XJOIN at 12000, and at 210K, then on track 057° to cross XPATH at 10500, then on track 350° to cross XBEEE at 9000 and at or below 240K. Expect ILS or RNAV RWY 35R approach.

LANDING KCFO: From ZOMBZ on track 081° to cross XBOXX between 13000 and 14000, then on track 082° to cross DORLE at 12000 and at 210K, then on track 067° to cross SEESU at 11000 and at 210K, then on track 067° . Expect RADAR vectors to final approach course.

LOST COMMUNICATIONS

In the event of lost communications prior to runway transition assignment, when KAPA is landing north, proceed on the ILS RWY 35R approach, when KAPA is landing south, proceed on the RNAV (GPS) RWY 17L from LOWRE.
LANDING CFO: proceed on the ILS RWY 26 approach via SKIPI.

PROTOTYPE-NOT FOR NAVIGATION

SW-1
12-30-24
COMPILER: JUN
REVIEWER:
DBL CHKR:
EFF DATE: FIG

(ZOMBZ.ZOMBZ5) 21308

OLD

ZOMBZ FIVE ARRIVAL (RNAV)

AL-5715 (FAA)

DENVER, COLORADO

SW-1, 31 OCT 2024 to 28 NOV 2024

SW-1, 31 OCT 2024 to 28 NOV 2024

ZOMBZ FIVE ARRIVAL (RNAV)

DENVER, COLORADO

(ZOMBZ.ZOMBZ5) 07OCT21

ARRIVAL ROUTE DESCRIPTION

STIFS TRANSITION (STIFS.ZOMBZ5)

LANDING KAPA RUNWAY 17L: From ZOMBZ on track 081° to cross XBOXX between 13000 and 14000, then on track 041° to cross XNICE at 12000, then on track 350° to cross ZHORN at 11000 and at 210K, then on track 350°. Expect RADAR vectors to final approach course.

LANDING KAPA RUNWAY 35R: From ZOMBZ on track 081° to cross XBOXX between 13000 and 14000, then on track 094° to cross XJOIN at 12000, then on track 060° to cross XPATH at 11000 and at 240K, then on track 350° to cross XBEEE at 9000 and at or below 240K. Expect ILS or LOC RWY 35R approach or as assigned by ATC.

LANDING KCFO: From ZOMBZ on track 081° to cross XBOXX between 13000 and 14000, then on track 082° to cross DORLE at 12000, then on track 070° to cross SEESU at 11000 and at 210K, then on track 070° . Expect RADAR vectors to final approach course.

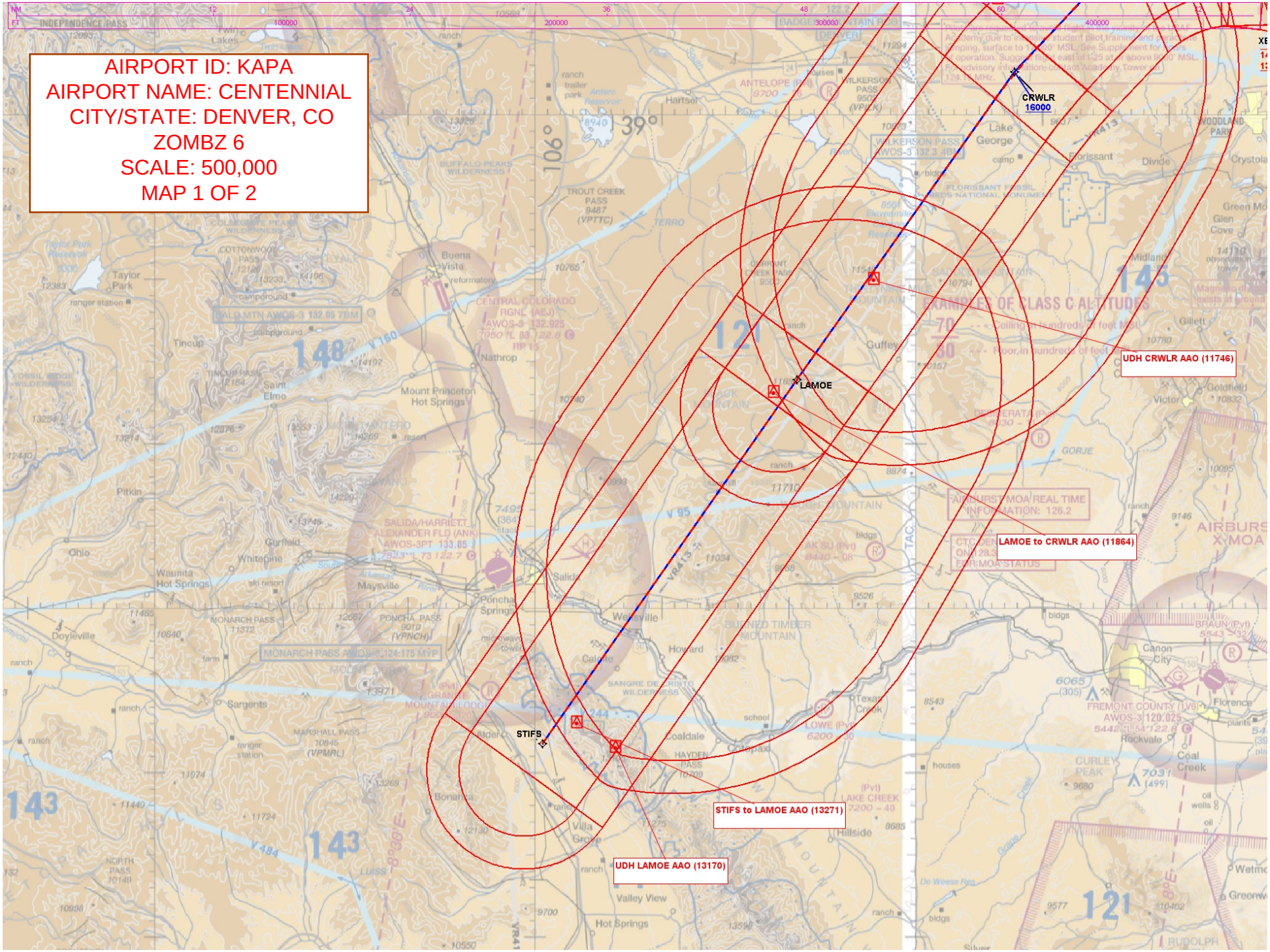
LOST COMMUNICATIONS

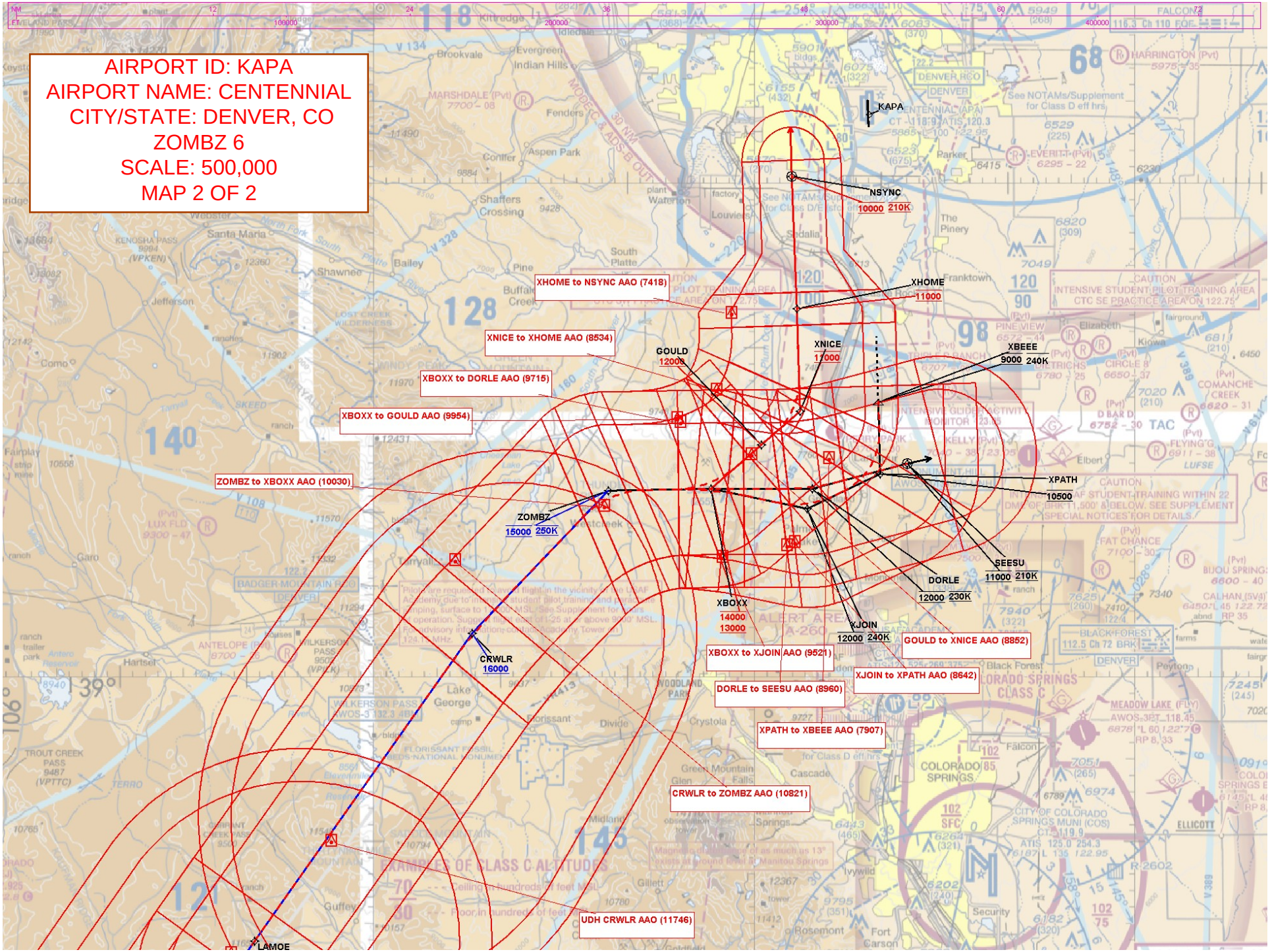
In the event of lost communications prior to runway transition assignment, when KAPA is landing north, execute the ILS RWY 35R approach, when KAPA is landing south, execute the RNAV (GPS) RWY 17L via LOWRE.

LANDING CFO: execute the ILS RWY 26 approach via SKIPI.

SW-1, 03 OCT 2024 to 31 OCT 2024

SW-1, 03 OCT 2024 to 31 OCT 2024


AIRPORT ID: KAPA
AIRPORT NAME: CENTENNIAL
CITY/STATE: DENVER, CO
ZOMBZ 6
SCALE: 500,000
MAP 1 OF 2
CRWLR
16000
LAMOE
UDH CRWLR AAO (11746)
LAMOE to CRWLR AAO (11864)
STIFS
STIFS to LAMOE AAO (13271)
UDH LAMOE AAO (13170)


AIRPORT ID: KAPA
AIRPORT NAME: CENTENNIAL
CITY/STATE: DENVER, CO
ZOMBZ 6
SCALE: 500,000
MAP 2 OF 2
KAPA
NSYNC
10000 210K
XHOME to NSYNC AAO (7418)
XHOME
11000
XNICE to XHOME AAO (8534)
GOULD
12000
XNICE
12000
XBEEE
9000 240K
XBOXX to DORLE AAO (9715)
XBOXX to GOULD AAO (9954)
ZOMBZ to XBOXX AAO (10030)
XPATH
10500
ZOMBZ
15000 250K
SEESU
11000 210K
DORLE
12000 230K
XBOXX
14000
13000
XJOIN
12000 240K
GOULD to XNICE AAO (8852)
XBOXX to XJOIN AAO (9521)
XJOIN to XPATH AAO (8642)
CRWLR
16000
DORLE to SEESU AAO (8960)
XPATH to XBEEE AAO (7907)
CRWLR to ZOMBZ AAO (10821)
UDH CRWLR AAO (11746)
LAMOE