

Optimization of Airspace and Procedures in the Metroplex (OAPM)

Northern California Design and Implementation Team

Final Report

May 3, 2013
(Updated March 27, 2014)

Prepared by:

**United States Department of Transportation
Federal Aviation Administration**



Table of Contents

I. Design Submission Executive Summary

1.0	Optimization of Airspace and Procedures in the Metroplex	1
2.0	Overview of the Northern California OAPM Design Team	1
3.0	Scope and Process	2
4.0	Proposed Solutions.....	3
5.0	Key Deliverables and Recommendations	3

II. Proposed Final Design Packages

I. Design Submission Executive Summary

Note: The design packages included in this report are proposed procedure designs and are included for illustrative purposes only.

1.0 Optimization of Airspace and Procedures in the Metroplex

In September 2009, the Federal Aviation Administration (FAA) received the RTCA's Task Force 5 Final Report on Mid-Term NextGen Implementation, containing recommendations concerning the top priorities for the implementation of NextGen initiatives. A key component of the FAA response to the RTCA recommendations was the formation of teams leveraging FAA and Industry Performance Based Navigation (PBN) expertise and experience to expedite implementation of optimized airspace and procedures.

Optimization of Airspace and Procedures in the Metroplex (OAPM) is a systematic, integrated and expedited approach to implementing PBN procedures and associated airspace changes. OAPM was developed in direct response to the recommendations from Task Force 5 on the quality, timeliness, and scope of Metroplex solutions.

OAPM focuses on a geographic area, rather than a single airport. This approach considers multiple airports and the airspace surrounding a metropolitan area, including all types of operations. The OAPM initiative is intended to enable accelerated development and implementation of beneficial PBN procedures.

The OAPM process is made up of five phases: Study, Design, Evaluation, Implementation, and Post Implementation. This Executive Summary describes the Design Phase, while Section II, Proposed Final Design Packages, provides the detailed designs that will be carried forward to the Evaluation Phase.

2.0 Overview of the Northern California OAPM Design Team

The Northern California Design Team has been working in a collaborative¹ manner since March 2012. The Northern California OAPM Study Team Final Report, dated May 20, 2011, served as the foundation for the Design Team's scope of work. With the ultimate goal of creating designs that support both FAA and industry needs, the Design Team focused on improving upon the Study Team's conceptual designs in order to address identified operational and efficiency issues through the application of PBN procedures and associated airspace changes within the Northern California Metroplex.

The Study Team identified conceptual PBN solutions that resulted in both quantitative and qualitative efficiency gains. The estimated annual fuel savings were between \$6.5 million

¹ An FAA manager and a NATCA Article 48 Representative acted as Co-Leads for the project with participants from the FAA Air Traffic Control (ATC) facilities, National Air Traffic Controller Association (NATCA), ATC subject matter experts (SMEs), Industry stakeholders, representatives from the Western Service Area, other FAA lines of business such as PBN Policy and Support and Flight Procedures, as well as MITRE/CAASD, and various support contractors.

and \$15.5 million.² These estimates were developed by the National Analysis Team (NAT) based on the Study Team's conceptual designs, and do not reflect the refinements made by the Northern California Metroplex Design Team. Quantitative benefits were derived from reductions in level segments and/or track distances, which reduce fuel burn and emissions. The qualitative benefits expected by the Study Team include reduced ATC and pilot task complexity, reduced pilot/controller communications, and repeatable and predictable flight paths.

The final designs proposed by the Northern California Design Team refine the Study Team recommendations to increase efficiency in the Metroplex. These efficiencies include maximizing the use of existing aircraft technologies and aircrew capabilities, and optimizing vertical profiles to eliminate or reduce level flight segments. The Design Team was able to develop procedural changes to improve both lateral and vertical paths for Standard Terminal Arrival Routes (STARs) and Standard Instrument Departure procedures (SIDs) to reduce fuel burn and emissions, to de-conflict arrival and departure procedures and enhance safety, to provide for repeatable/predictable flight paths, improved flight planning and to reduce ATC task complexity.

3.0 Scope and Process

The Northern California Metroplex consists of airspace delegated to the Northern California Terminal Radar Approach Control (NCT) and the Oakland Air Route Traffic Control Center (ZOA). Specific airports within the lateral confines of NCT airspace were selected based on their proximity to each other and interaction with each other within NCT and ZOA airspace. The Northern California OAPM Design Team focused on aircraft operations at San Francisco International Airport (SFO), Oakland International Airport (OAK), San Jose International Airport (SJC) and Sacramento International Airport (SMF).

The Design Team began the process by reviewing the Study Team Final Report to identify all conceptual proposals. While the Study Team Report provided the framework for the Design Team activities, the Design Team had the flexibility to modify or adjust the Study Team proposals if the changes enhanced the expected benefit or if the changes were operationally necessary, provided they did not significantly reduce the expected benefits, increase the expected costs, or extend the project timeline.

The Design Team divided into workgroups, which included industry representatives, and systematically developed and refined PBN and airspace designs that met the intent of the Study Team. For each individual proposed concept, the Design Team went through a design process considering alternative lateral and vertical paths, various speed and altitude

² The estimated fuel burn savings considered a lower bound based on a conservative European Organization for the Safety of Air Navigation (EUROCONTROL) Base of Aircraft Data (BADA) fuel burn model and an upper bound based on Industry stakeholder flight simulation analysis. This analysis was performed in 2011, and assumed a fuel price of \$2.77 per gallon.

restrictions, alternative leg types, different de-confliction options, and various charting considerations. The workgroup's preliminary designs were then shared with the full Design Team, allowing FAA, NATCA, SMEs and industry to provide additional input. Numerous tools were utilized to evaluate and refine the procedures including industry flight simulations, human-in-the-loop validations, flyability and criteria checks, as well as controller and industry feedback.

The remainder of the Design Phase focused on the refinement of the proposed final designs, ensuring that all procedures were constructed in accordance with applicable FAA Orders. Final design proposals were documented and signed by all affected FAA and NATCA stakeholders.

4.0 Proposed Solutions

The Design Team proposed 13 new RNAV STARs, 1 optimized RNAV STAR, 18 new RNAV DPs, 9 en route and terminal airspace change packages, 3 new Q routes and a proposed ZOA/ZLA transition plan (MCKEY/TOPCAT). These designs are captured in the Proposed Final Design Packages shown as an attachment to this document. The Design Team's recommendations include the development of Optimized Profile Descents (OPDs), and improved lateral and vertical paths for both STARs and DPs which reduce fuel burn and emissions. Arrival and departure procedures were de-conflicted where practical and designed to create repeatable/predictable flight paths, improved fuel planning, increase efficiency, reduce ATC task complexity, and enhance safety.

Each Design Package describes the issues and conceptual solutions identified by the Study Team as well as design refinements, dependencies among various proposals, graphical depictions, and a broad overview of expected benefits. While no new quantitative benefits have been calculated as of the end of the Northern California OAPM Design phase, it is anticipated that the benefits will meet or exceed those estimates included in the Northern California Study Team Final Report. Stakeholders will begin realizing benefits with the first major implementation currently scheduled for November 2014.

5.0 Key Deliverables and Recommendations

The Northern California OAPM team's systematic approach has allowed the Design Team to create procedures that optimize and de-conflict competing routes to four international airports.

The deliverables for the Northern California Design Phase include the Executive Summary and the Proposed Final Design Packages, provided in Section II.

II. Proposed Final Design Packages

Note: The design packages included in this report are proposed procedure designs and are included for illustrative purposes only.

Proposed Final Design Packages

Oakland International Airport

1. OAK CNDEL RNAV DP
2. OAK EMZOH STAR
4. OAK HUSSH RNAV DP
5. OAK KATFH RNAV DP
6. OAK OAKES STAR
7. OAK WNSDR STAR¹

San Francisco International Airport

1. SFO BDEGA STAR
2. SFO CIITY RNAV DP
3. SFO DYAMD STAR
4. SFO FOGGG RNAV DP
5. SFO GNNRR RNAV DP
6. SFO NIITE RNAV DP
7. SFO SAHEY RNAV DP
8. SFO SERFR STAR
9. SFO SNTNA RNAV DP
10. SFO SSTIK RNAV DP
11. SFO STLER STAR
12. SFO TRUKN RNAV DP
13. SFO WESLA RNAV DP
14. SFO YOSEM STAR

San Jose International Airport

1. ALMDN RNAV DP
2. BMRNG RNAV DP
3. BRIXX STAR
4. FRLON STAR
5. SHVVR STAR
6. SILCN STAR
7. TECKY RNAV DP

Sacramento International Airport

1. FTHIL RNAV DP
2. RVRCT RNAV DP
3. SCTWN RNAV DP
4. SLMMR STAR
5. SUUTR STAR

¹ The WNSDR STAR and ANNET STAR are identical with the exception of runways served. The WNSDR STAR serves Runways 28L/R and 30 and the ANNET STAR serves Runways 10 R/L and 12.

Northern California (NorCal) OAPM Design Package

OAK CNDEL RNAV DP (formerly OAK SKYLINE SID and OAK COAST SID)

NorCal Design Team Reference: OAK_CNDEL_DP_ver6.3

Name of Change	Date
OAK CNDEL RNAV DP	12/21/2012
Change Classification	Current Phase of Design
Terminal Departure Procedure (DP)	<input type="checkbox"/> Preliminary Design (PD) <input type="checkbox"/> Operational Design (OD) <input type="checkbox"/> Operational Design Complete (ODC) <input checked="" type="checkbox"/> Proposed Final Design (PFD)
OAPM Study Team Reference(s)	Implementation Date
4.2.2.1	2014
Affected Facilities and Positions, Areas, and/or Sectors	Facility Points of Contact
Oakland ARTCC (ZOA): Sectors: 11 13 14--Big Sur High Northern California TRACON (NCT): Sectors: Sutro Quake Oakland Tower (OAK)	ZOA: James Meadows 510-745-3469 Robert Newray 510-918-6859 NCT: Paul Pegadiotes 916-366-4048 Richard Hull 916-201-3206 OAK: Sean Cullinane 510-273-7418 x213 Juan Serner-Spuler 408-761-6625
Related/Dependent Submissions	Associated Data Files
NCT West Plan Airspace Change	[List associated data files (e.g. TARGETS/PDARs/SDAT) that are not attached to this submission]

Purpose

The purpose of the proposed procedure is to enhance the current conventional OAK SKYLINE and OAK COAST SIDs (Figure 1) and address the following items identified by the NorCal OAPM Study and Design Teams for OAK departures:

- Flight Tracks do not follow published route.
- Lack of repeatable predictable flight paths.
- Efficient Cost to Carry (CTC) fuel planning.

Northern California (NorCal) OAPM Design Package

OAK CNDEL RNAV DP (formerly OAK SKYLINE SID and OAK COAST SID)

NorCal Design Team Reference: OAK_CNDEL_DP_ver6.3

- Optimization of lateral/vertical flight paths.
- Use of Performance Based Navigation (PBN).

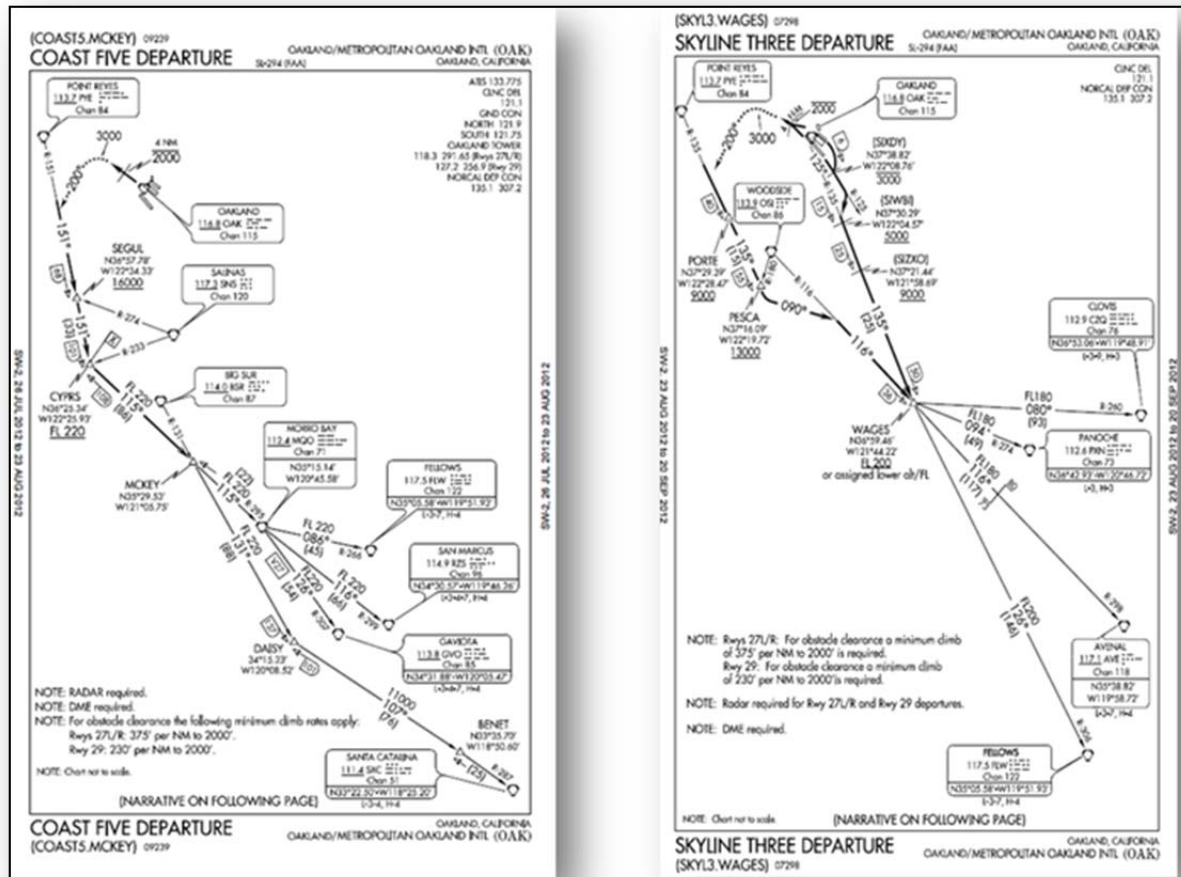


Figure 1: Current Procedures

Study Team Recommendation

The NorCal OAPM Study Team made the following recommendations:

- Combine current OAK SKYLINE and COAST SIDs into a single RNAV departure procedure.
- Align new RNAV departure procedures with current traffic flows.
- Create an RNAV SID from OAK to the south and southeast.
- Create an RNAV SID that provides a predictable, repeatable path.
- Create multiple en route departure transitions.

Northern California (NorCal) OAPM Design Package

OAK CNDEL RNAV DP (formerly OAK SKYLINE SID and OAK COAST SID)

NorCal Design Team Reference: OAK_CNDEL_DP_ver6.3

Figure 2 illustrates the published procedure (solid blue) and the proposed routes (dashed red), as well as current tracks (teal).

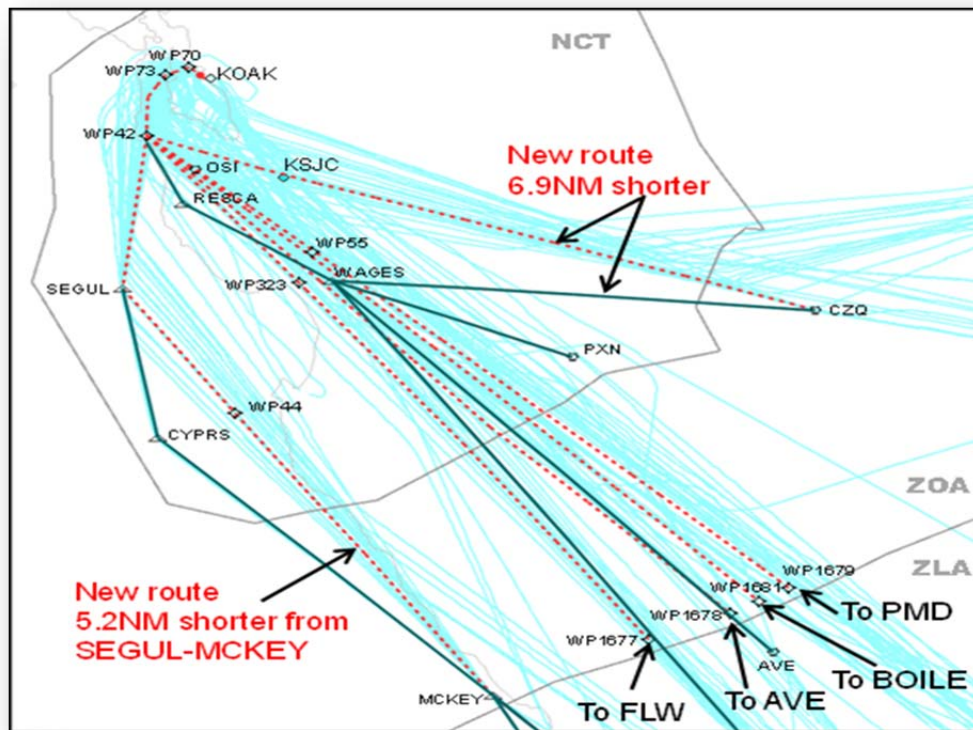


Figure 2: Study Team Recommendation

Proposed Final Design

The NorCal Design Team is proposing the creation of a new RNAV procedure for southbound OAK Runway 29 and Runway 27 departures.¹ This new design combines the OAK COAST and SKYLINE SIDs into a single RNAV procedure. The current conventional OAK COAST and SKYLINE procedures will continue to be used by aircraft unable to utilize Performance Based Navigation (PBN) procedures.

¹ Due to a magnetic variation adjustment effective October 2013, Runway 29 and Runway 27 will be renamed Runway 30 and Runway 28 respectively.

Northern California (NorCal) OAPM Design Package

OAK CNDEL RNAV DP (formerly OAK SKYLINE SID and OAK COAST SID)

NorCal Design Team Reference: OAK_CNDEL_DP_ver6.3

The new OAK CNDEL RNAV DP is illustrated in Figure 3. The new design elements and benefits include:

- Combination of the OAK SKYLINE and the COAST SID into a single RNAV DP.
- The lateral track of the OAK RNAV CNDEL design is shorter than the current conventional OAK SKYLINE and COAST procedures.
- Six optimized transitions improve flow efficiency and flexibility.
- Use of Performance Based Navigation (PBN).
- Optimization of lateral flight paths.
- Elimination of ground based Navaid dependency.
- Predictable and repeatable flight tracks.
- Reduction in controller workload and controller/pilot transmissions.
- Efficient Cost to Carry (CTC) fuel planning.
- Routes are designed to maximize efficiencies utilizing expanded terminal to en route transitional separation (3 NM increasing to 5 NM).
- Design differences include the use of earlier course divergence at the PORTE Fix which resulted in six optimized transitions.

Northern California (NorCal) OAPM Design Package

OAK CNDEL RNAV DP (formerly OAK SKYLINE SID and OAK COAST SID)

NorCal Design Team Reference: OAK_CNDEL_DP_ver6.3

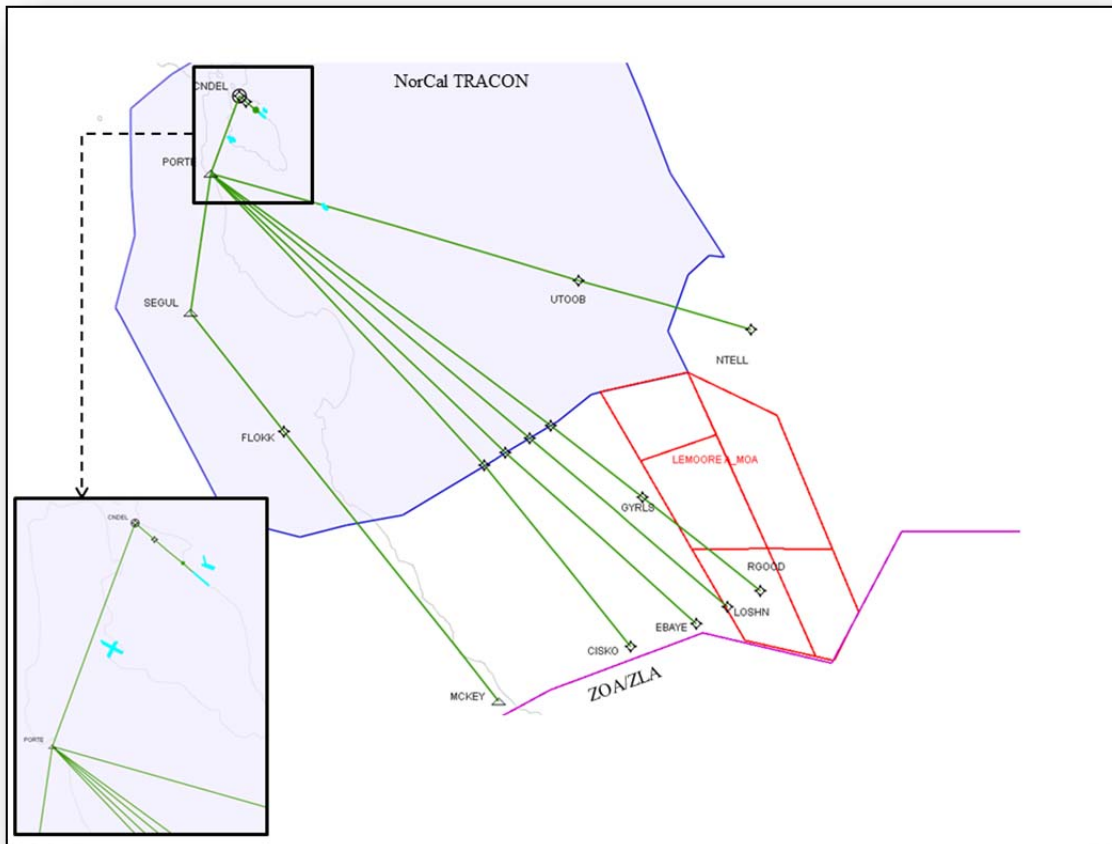


Figure 3: Proposed Design

Additional Design Considerations

Validation of the proposed design has been accomplished through Human-in-the-Loop (HITL) simulations.

The proposed changes do not require a spectrum analysis.

Implementation Dependencies

The OAK CNDEL RNAV DP is not dependent on any other proposed designs and can be submitted independently from all other NorCal proposed designs as soon as practical for action/processing.

Northern California (NorCal) OAPM Design Package

OAK CNDEL RNAV DP (formerly OAK SKYLINE SID and OAK COAST SID)

NorCal Design Team Reference: OAK_CNDEL_DP_ver6.3

This proposed design requires amendments/modifications to:

- ZOA, NCT, and OAK Standard Operating Procedures (SOP).
- ZOA/NCT and NCT/OAK Letters of Agreement (LOA).
- Automation.
- NCT West Plan Airspace.

No additional staffing, facilities or equipment is anticipated for this proposed design.

Attachments

Terminal Procedures:

- TARGETS Distribution Package.
- Flight Simulator Worksheet.
- RNAV Pro analysis results.
- HITL Documentation.

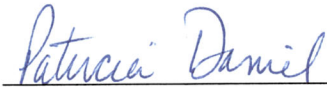
Northern California (NorCal) OAPM Design Package

OAK CNDEL RNAV DP (formerly OAK SKYLINE SID and OAK COAST SID)

NorCal Design Team Reference: OAK_CNDEL_DP_ver6.3

Review Signatures

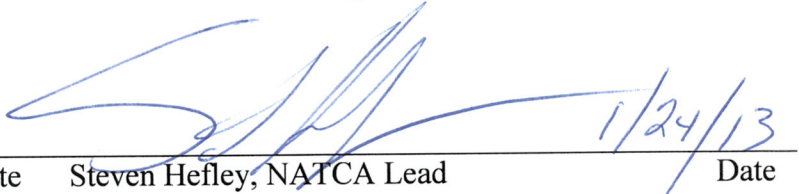
The D&I Team reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.



Patricia Daniel, FAA Lead
Northern California OAPM

1-24-13

Date



Steven Hefley, NATCA Lead
Northern California OAPM

1/24/13


Date



John F. Fisher, Facility POC
Oakland ARTCC

1/24/13


Date



Robert Newray, NATCA POC
Oakland ARTCC

1/24/13

Date



Paul Pegadiotes, Facility POC
Northern California TRACON

1/24/13

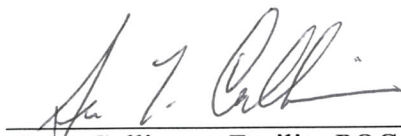
Date



Richard Hull, NATCA POC
Northern California TRACON

1/24/13

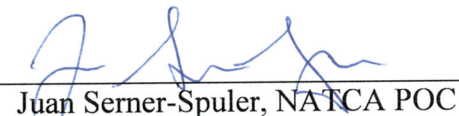
Date



Sean Cullinane, Facility POC
Oakland Tower

1/17/13

Date



Juan Serner-Spuler, NATCA POC
Oakland Tower

1/17/13

Date

Northern California (NorCal) OAPM Design Package

OAK EMZOH STAR (formerly OAK COMMO STAR and OAK PANOCHÉ STAR)

NorCal OAK_EMZOH_STAR_Ver 6.3 OAK_EMZOH_STAR_ver6.3

Name of Change	Date
OAK EMZOH STAR	12/21/2012
Change Classification	Current Phase of Design
Terminal Procedure STAR	<input type="checkbox"/> Preliminary Design (PD) <input type="checkbox"/> Operational Design (OD) <input type="checkbox"/> Operational Design Complete (ODC) <input checked="" type="checkbox"/> Proposed Final Design (PFD)
OAPM Study Team Reference(s)	Implementation Date
4.6.2.3	2014
Affected Facilities and Positions, Areas, and/or Sectors	Facility Points of Contact
Oakland ARTCC (ZOA): Sectors: 11 13-Panoche High Northern California TRACON (NCT): Sectors: Turlock Morgan Sunol Niles Mulford Grove Cedar	ZOA: James Meadows 510-745-3469 Robert Newray 510-918-6859 ZLA: Steven Fragas Jose Gonzalez NCT: Paul Pegadiotes 916-366-4048 Richard Hull 916-201-3206
Related/Dependent Submissions	Associated Data Files
NCT West Plan and NCT East Plan Airspace Changes	Master TARGETS File

Purpose

The purpose of the proposed procedure is to enhance the current conventional OAK COMMO and OAK PANOCHÉ STARs (Figure 1) and address the following items identified by the NorCal OAPM Study and Design Teams:

- Flight Tracks do not follow published route.
- Lack of repeatable predictable flight paths.
- Optimization of lateral/vertical flight paths.
- Procedurally de-conflict from other area STARs.

Northern California (NorCal) OAPM Design Package

OAK EMZOH STAR (formerly OAK COMMO STAR and OAK PANOCHÉ STAR)

NorCal OAK_EMZOH_STAR_Ver 6.3 OAK_EMZOH_STAR_ver6.3

- Efficient Cost to Carry (CTC) fuel planning.
- Use of Performance Based Navigation (PBN).

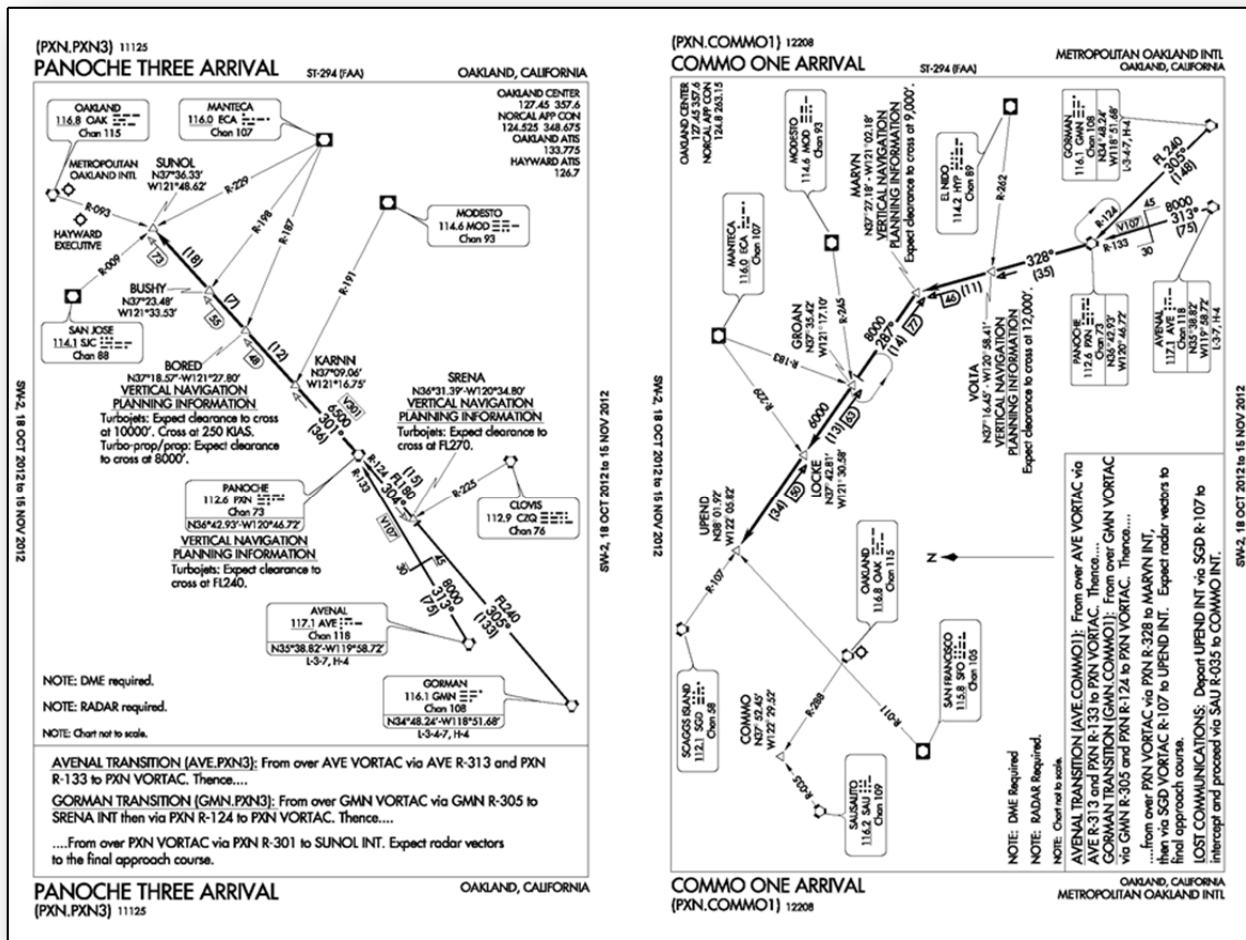


Figure 1: Current Procedures

Study Team Recommendation

The NorCal OAPM Study Team made the following recommendations for improved design of PXN STAR:

- Provide procedural de-confliction from other procedures.
- Have predictable repeatable paths.
- Include OPD benefits.

Northern California (NorCal) OAPM Design Package

OAK EMZOH STAR (formerly OAK COMMO STAR and OAK PANOCHÉ STAR)

NorCal OAK_EMZOH_STAR_Ver 6.3 OAK_EMZOH_STAR_ver6.3

- Align with current flight paths.
- Accommodate multiple approach transitions into OAK.

Figure 2 illustrates the published procedure (solid red) and the Study Team proposed routes (dashed blue), as well as current tracks (pink).

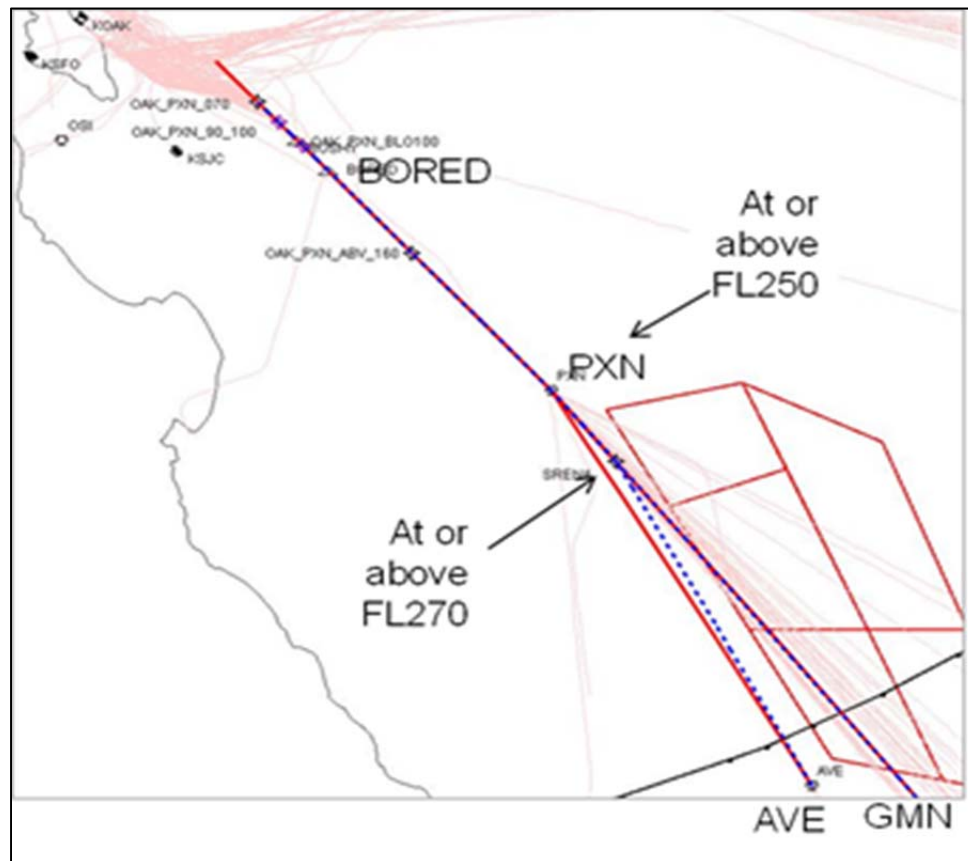


Figure 2: Study Team Recommendation

Proposed Final Design

The NorCal Design Team is proposing a new RNAV procedure named the OAK EMZOH STAR (Figure 3). This new design combines the OAK COMMO and OAK PANOCHÉ STARs into a single RNAV procedure. The current conventional OAK PANOCHÉ and OAK COMMO STARs will continue to be used by aircraft unable to utilize Performance Based Navigation (PBN) procedures.

The new design elements and benefits include:

NorCal OAK_EMZOH_STAR_Ver 6.3 OAK_EMZOH_STAR_ver6.3

-

¹ Due to a magnetic variation adjustment effective October 2013, Runway 29 and Runway 27 will be renamed Runway 30 and Runway 28 respectively.

Northern California (NorCal) OAPM Design Package

OAK EMZOH STAR (*formerly OAK COMMO STAR and OAK PANOCHÉ STAR*)

NorCal OAK_EMZOH_STAR_Ver 6.3 OAK_EMZOH_STAR_ver6.3

NorCal Design Team differences include:

- The combination of two non-conventional procedures into a single STAR, independent of NCT West or East Plan configuration.
- Reduction of En route transitions from two to one.
- En route transitions are contained within ZOA airspace.

Additional Design Considerations

Validation of the proposed design has been accomplished through Human-in-the-Loop (HITL) simulations.

The proposed changes do not require a spectrum analysis.

Implementation Dependencies

The OAK EMZOH STAR is not dependent on any other proposed designs and can be submitted separately as soon as practical for action/processing.

This proposed design requires amendments/modifications to:

- NCT West and East Plan Airspace Changes.
- ZOA and NCT Standard Operating Procedures (SOP).
- ZOA/ZLA and ZOA/NCT Letters of Agreement (LOA).
- Automation.

No additional staffing, facilities or equipment is anticipated for this proposed design.

Attachments

Terminal Procedures:

- TARGETS Distribution Package.
- Flight Simulator Worksheet.
- RNAV Pro analysis results.
- HITL Documentation.


Northern California (NorCal) OAPM Design Package

OAK EMZOH STAR (formerly OAK COMMO STAR and OAK PANOCHÉ STAR)

NorCal OAK EMZOH STAR Ver 6.3.docx OAK_EMZOH_STAR_ver6.3

Review Signatures

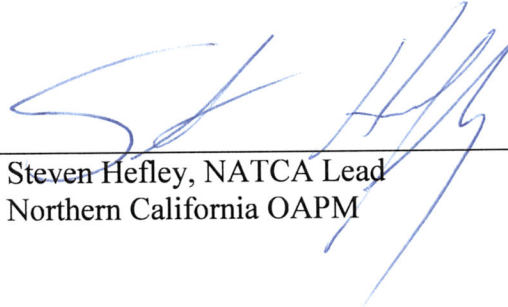
The D&I Team reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.



Patricia Daniel, FAA Lead
Northern California OAPM

1-24-13

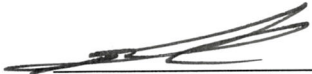
Date



Steven Hefley, NATCA Lead
Northern California OAPM

1-24-13

Date



John F. Fisher, Facility POC
Oakland ARTCC

1/24/13

Date



Robert Newray, NATCA POC
Oakland ARTCC

1/24/13

Date



Paul Pegadiotes, Facility POC
Northern California TRACON

1/24/13

Date



Richard Hull, NATCA POC
Northern California TRACON

1/24/13

Date

Northern California (NorCal) OAPM Design Package

OAK HUSSH RNAV DP (formerly OAK SILENT SID)

NorCal Design Team Reference: OAK_HUSSH_DP_ver6.3

Name of Change	Date
OAK HUSSH RNAV DP	12/21/2012
Change Classification	Current Phase of Design
Terminal Departure Procedure (DP)	<input type="checkbox"/> Preliminary Design (PD) <input type="checkbox"/> Operational Design (OD) <input type="checkbox"/> Operational Design Complete (ODC) <input checked="" type="checkbox"/> Proposed Final Design (PFD)
OAPM Study Team Reference(s)	Implementation Date
4.9.4	2014
Affected Facilities and Positions, Areas, and/or Sectors	Facility Points of Contact
Oakland ARTCC (ZOA): Sectors: 29-Linden High 31-Red Bluff 32 41 Northern California TRACON (NCT): Sectors: Richmond Sutro Fairfield Oakland Tower (OAK)	ZOA: James Meadows 510-745-3469 Robert Newray 510-918-6859 NCT: Paul Pegadiotes 916-366-4048 Richard Hull 916-201-3206 OAK: Sean Cullinane 510-273-7418 x213 Juan Serner-Spuler 408-761-6625
Related/Dependent Submissions	Associated Data Files
NCT West Plan Airspace Change	[List associated data files (e.g. TARGETS/PDARs/SDAT) that are not attached to this submission]

Purpose

The purpose of the proposed procedure is to enhance the current conventional OAK SILENT SID (Figure 1) and address the following items identified by the NorCal OAPM Study and Design Teams for OAK departures:

- Flight Tracks do not follow published route.
- Lack of repeatable predictable flight paths.
- Efficient Cost to Carry (CTC) fuel planning.

Northern California (NorCal) OAPM Design Package

OAK HUSSH RNAV DP (formerly OAK SILENT SID)

NorCal Design Team Reference: OAK_HUSSH_DP_ver6.3

- Optimization of lateral/vertical flight paths.
- Use of Performance Based Navigation (PBN).

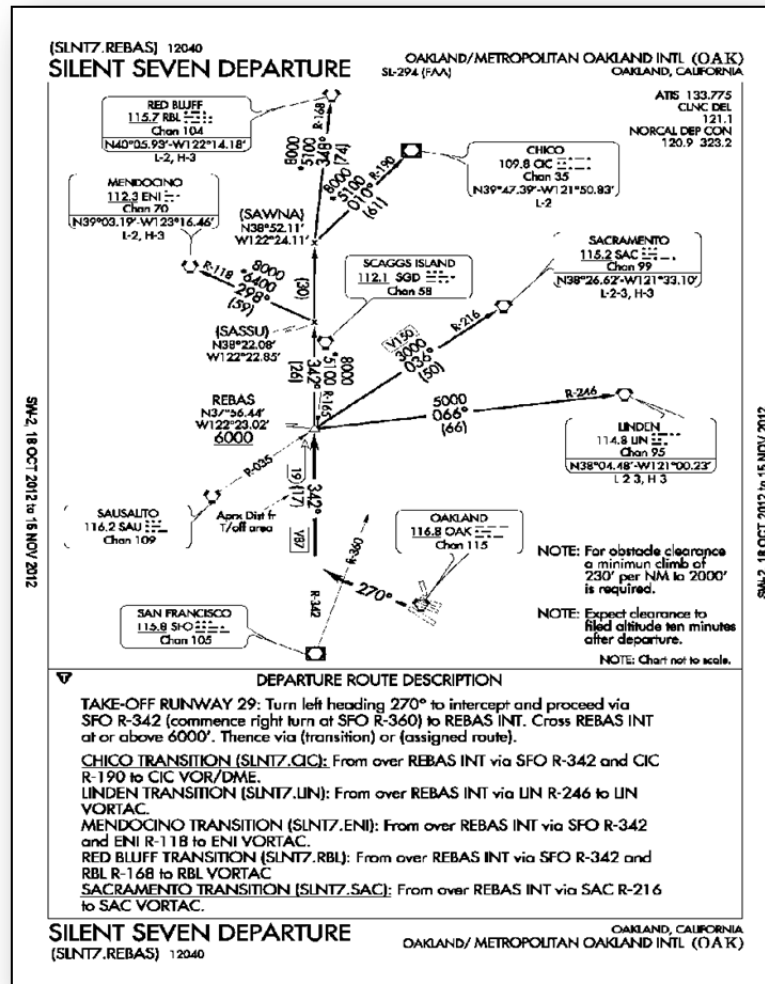


Figure 1: Current Procedure

Study Team Recommendation

Although the NorCal Study Team did not create a new procedural design however they made the following recommendations:

- Create an RNAV procedure with vertical profiles.
- Design an RNAV procedure that will allow for a repeatable, predictable path.

Northern California (NorCal) OAPM Design Package

OAK HUSSH RNAV DP (*formerly* OAK SILENT SID)

NorCal Design Team Reference: OAK_HUSSH_DP_ver6.3

Proposed Final Design

The NORCAL Design Team is proposing the creation of a new RNAV procedure for OAK Runway 29 departure traffic.¹ The current conventional OAK SILENT SID will continue to be used by aircraft unable to utilize Performance Based Navigation (PBN) procedures. This procedure is designed for use between the hours of 2200 to 0700 local time.

The new OAK HUSSH RNAV DP is illustrated in Figure 2. The new design elements and benefits include:

- Seven optimized transitions improving flow efficiency and flexibility.
- Use of Performance Based Navigation (PBN).
- Optimization of lateral flight paths.
- Elimination of ground based Navaid dependency.
- Predictable and repeatable flight tracks.
- Reduction in controller workload and controller/pilot transmissions.
- Efficient Cost to Carry (CTC) fuel planning.
- Routes are designed to maximize efficiencies utilizing expanded terminal to en route transitional separation (3 NM increasing to 5 NM).

¹ Due to a magnetic variation adjustment effective October 2013, Runway 29 and Runway 27 will be renamed Runway 30 and Runway 28 respectively.

Northern California (NorCal) OAPM Design Package

OAK HUSSH RNAV DP (formerly OAK SILENT SID)

NorCal Design Team Reference: OAK_HUSSH_DP_ver6.3

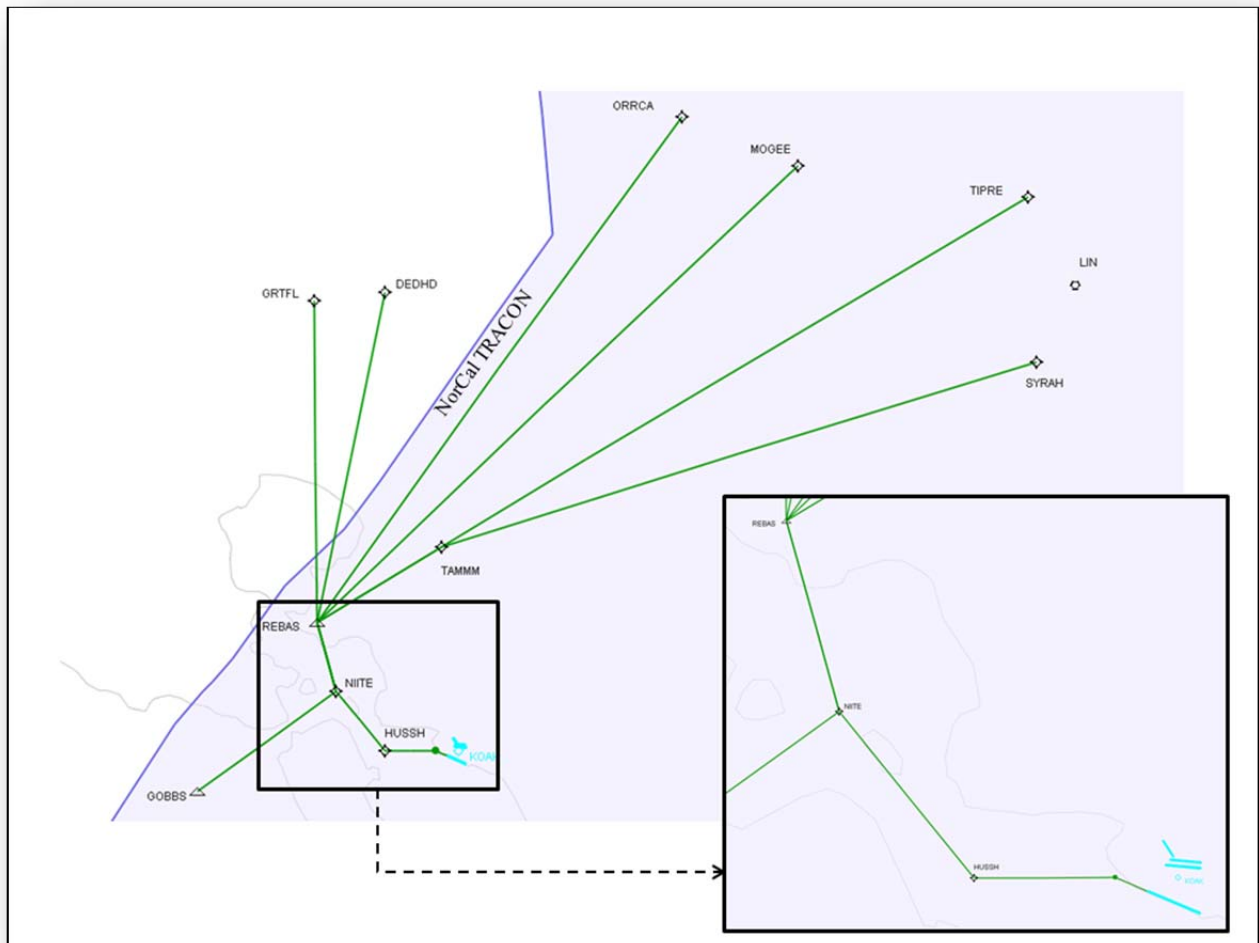


Figure 2: Proposed Design

Additional Design Considerations

The proposed changes do not require a spectrum analysis.

Implementation Dependencies

The OAK HUSSH RNAV DP is not dependent on any other proposed designs and can be submitted separately as soon as practical for action/processing.

This proposed design requires amendments/modifications to:

Northern California (NorCal) OAPM Design Package

OAK HUSSH RNAV DP (*formerly* OAK SILENT SID)

NorCal Design Team Reference: OAK_HUSSH_DP_ver6.3

- NCT and OAK Standard Operating Procedures (SOP).
- ZOA/NCT and NCT/OAK Letters of Agreement (LOA).
- Automation.
- NCT West Plan Airspace.

No additional staffing, facilities or equipment is anticipated for this proposed design.

Attachments

Terminal Procedures:

- TARGETS Distribution Package.
- Flight Simulator Worksheet.
- RNAV Pro analysis results.

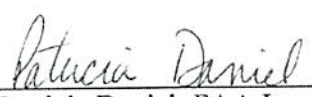


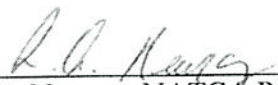
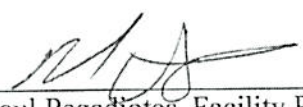

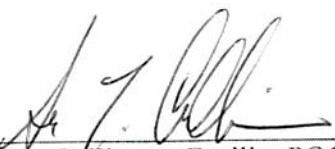
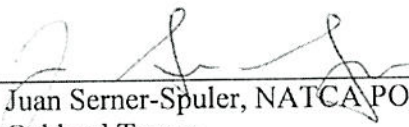
Northern California (NorCal) OAPM Design Package

OAK HUSSH RNAV DP (formerly OAK SILENT SID)

NorCal Design Team Reference: OAK_HUSSH_DP_ver6.3

Review Signatures

The D&I Team reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

 Patricia Daniel, FAA Lead Northern California OAPM	1-24-13 Date	 Steven Hefley, NATCA Lead Northern California OAPM	1/24/13 Date
 John F. Fisher, Facility POC Oakland ARTCC	1/24/13 Date	 Robert Newray, NATCA POC Oakland ARTCC	1/24/13 Date
 Paul Pegadiotes, Facility POC Northern California TRACON	1/24/13 Date	 Richard Hull, NATCA POC Northern California TRACON	1/24/13 Date
 Sean Cullinane, Facility POC Oakland Tower	1/25/13 Date	 Juan Serner-Spuler, NATCA POC Oakland Tower	1/17/13 Date

Northern California (NorCal) OAPM Design Package

OAK KATFH RNAV DP (formerly OAK SKYLINE SID)

NorCal Design Team Reference: OAK_KATFH_DP_ver6.3

Name of Change	Date
OAK KATFH RNAV DP	12/21/2012
Change Classification	Current Phase of Design
Terminal Departure Procedure (DP)	<input type="checkbox"/> Preliminary Design (PD) <input type="checkbox"/> Operational Design (OD) <input type="checkbox"/> Operational Design Complete (ODC) <input checked="" type="checkbox"/> Proposed Final Design (PFD)
OAPM Study Team Reference(s)	Implementation Date
None	2014
Affected Facilities and Positions, Areas, and/or Sectors	Facility Points of Contact
Oakland ARTCC (ZOA): Sectors: 11 13-Panoche High 14-Big Sur High 15-Clovis High 22 Northern California TRACON (NCT): Sectors: Sutro Richmond Diablo Oakland Tower (OAK)	ZOA: James Meadows 510-745-3469 Robert Newray 510-918-6859 NCT: Paul Pegadiotes 916-366-4048 Richard Hull 916-201-3206 OAK: Sean Cullinane 510-273-7418 x213 Juan Serner-Spuler 408-761-6625
Related/Dependent Submissions	Associated Data Files
NCT East Plan Airspace Change	Master TARGETS File

Purpose

The purpose of the proposed procedure is to enhance the current conventional OAK SKYLINE SID (Figure 1) and address the following items identified by the NorCal OAPM Design Team for OAK departures:

Northern California (NorCal) OAPM Design Package

OAK KATFH RNAV DP (formerly OAK SKYLINE SID)

NorCal Design Team Reference: OAK_KATFH_DP_ver6.3

- Flight Tracks do not follow published route.
- Lack of repeatable predictable flight paths.
- Efficient Cost to Carry (CTC) fuel planning.
- Optimization of lateral/vertical flight paths.
- Use of Performance Based Navigation (PBN).

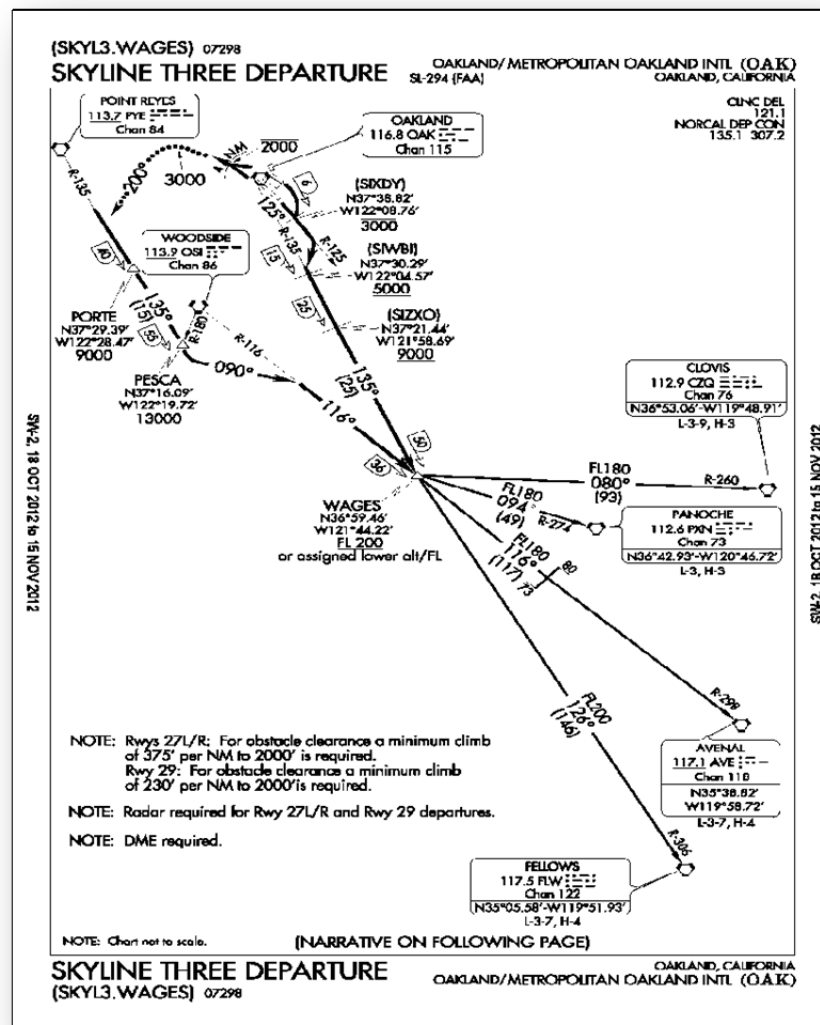


Figure 1: Current Procedure

Northern California (NorCal) OAPM Design Package

OAK KATFH RNAV DP (formerly OAK SKYLINE SID)

NorCal Design Team Reference: OAK_KATFH_DP_ver6.3

Study Team Recommendation

The NorCal Study Team did not provide recommendation on this particular procedure, however after further analysis the NorCal Design Team proposed a new procedure to optimize and add efficiency to current operations.

Proposed Final Design

The NorCal Design Team is proposing the creation of a new RNAV procedure for OAK Runway 11 and 09 departures to be named the OAK KATFH RNAV DP.¹ The current conventional OAK SKYLINE SID will continue to be used by aircraft unable to utilize Performance Based Navigation (PBN) procedures.

The new OAK KATFH RNAV DP is illustrated in Figure 2. The new design elements and benefits include:

- En route departure transitions were optimized and increased from four to five improving flow efficiency and flexibility.
- Compatible with the proposed SFO FOGGG and SFO CIITY DPs.
- Use of Performance Based Navigation (PBN).
- Optimization of lateral flight paths.
- Elimination of ground based Navaid dependency.
- Predictable and repeatable flight tracks.
- Reduction in controller workload and controller/pilot transmissions.
- Efficient Cost to Carry (CTC) fuel planning.
- Routes are designed to maximize efficiencies utilizing expanded terminal to en route transitional separation (3 NM increasing to 5 NM).

¹ Due to a magnetic variation adjustment, effective October 2013 Runway 11 will be renamed Runway 12 and Runway 09 will be renamed Runway 10.

Northern California (NorCal) OAPM Design Package

OAK KATFH RNAV DP (formerly OAK SKYLINE SID)

NorCal Design Team Reference: OAK_KATFH_DP_ver6.3

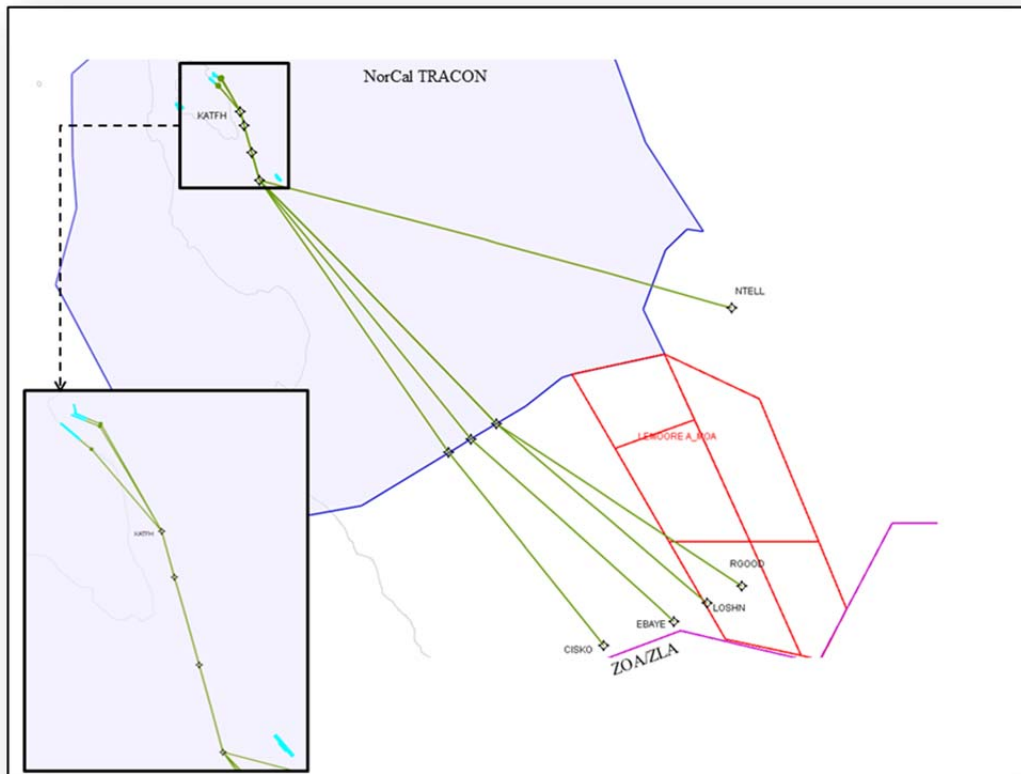


Figure 2: Proposed Procedure

Additional Design Considerations

Validation of the proposed design has been accomplished through Human-in-the-Loop (HITL) simulations.

The proposed changes do not require a spectrum analysis.

Northern California (NorCal) OAPM Design Package

OAK KATFH RNAV DP (formerly OAK SKYLINE SID)

NorCal Design Team Reference: OAK_KATFH_DP_ver6.3

Implementation Dependencies

The proposed OAK KATFH procedure was designed to be compatible with the new SFO CIITY and FOGGG procedure designs. It is not dependent on any proposed designs and can be submitted separately and as soon as practical for action/processing.

This proposed design requires amendments/modifications to:

- NCT, ZOA and OAK Standard Operating Procedures (SOP).
- ZOA/NCT and NCT/OAK Letters of Agreement (LOA).
- Automation.
- NCT East Plan Airspace.

No additional staffing, facilities or equipment is anticipated for this proposed design.

Attachments

Terminal Procedures:

- TARGETS Distribution Package.
- Flight Simulator Worksheet.
- RNAV Pro analysis results.
- HITL Documentation.

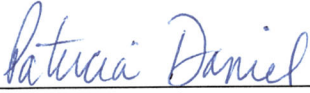
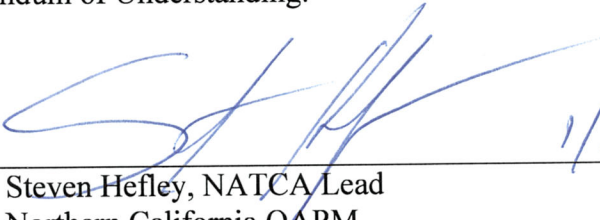

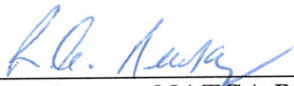

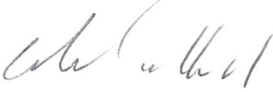

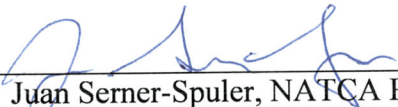
Northern California (NorCal) OAPM Design Package

OAK KATFH RNAV DP (formerly OAK SKYLINE SID)

NorCal Design Team Reference: OAK_KATFH_DP_ver6.3

Review Signatures

The D&I Team reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

 Patricia Daniel, FAA Lead Northern California OAPM	1-24-13 Date	 Steven Hefley, NATCA Lead Northern California OAPM	1/24/13 Date
 John F. Fisher, Facility POC Oakland ARTCC	1/24/13 Date	 Robert Newray, NATCA POC Oakland ARTCC	1/24/13 Date
 Paul Pegadiotes, Facility POC Northern California TRACON	1/24/13 Date	 Richard Hull, NATCA POC Northern California TRACON	1/24/13 Date
 Sean Cullinane, Facility POC Oakland Tower	1/17/13 Date	 Juan Serner-Spuler, NATCA POC Oakland Tower	1/17/13 Date

Northern California (NorCal) OAPM Design Package

OAK OAKES STAR (formerly OAK MADWIN STAR and OAK MANTECA STAR)

NorCal OAK OAKES STAR Ver 6.3 OAK_OAKES_STAR_ver6.3

Name of Change	Date
OAK OAKES STAR	12/21/2012
Change Classification	Current Phase of Design
Terminal Procedure STAR	<input type="checkbox"/> Preliminary Design (PD) <input type="checkbox"/> Operational Design (OD) <input type="checkbox"/> Operational Design Complete (ODC) <input checked="" type="checkbox"/> Proposed Final Design (PFD)
OAPM Study Team Reference(s)	Implementation Date
4.6.2.1 and 4.6.2.4	2014
Affected Facilities and Positions, Areas, and/or Sectors	Facility Points of Contact
Oakland ARTCC (ZOA): Sectors: 22 29-Linden High 30-Mina High 32 33-Coaldale High 34-Modesto High 44 45 46 Northern California TRACON (NCT): Sectors: Sunol Mulford Grove Niles Fairfield	ZOA: James Meadows 510-745-3469 Robert Newray 510-918-6859 NCT: Paul Pegadiotes 916-366-4048 Richard Hull 916-201-3206
Related/Dependent Submissions	Associated Data Files
SMF SUUTR STAR ZOA Sector 34 Airspace Shelf NCT West and East Plan Airspace Change	Master TARGETS File

Northern California (NorCal) OAPM Design Package

OAK OAKES STAR (formerly OAK MADWIN STAR and OAK MANTECA STAR)

NorCal OAK OAKES STAR Ver 6.3 OAK_OAKES_STAR_ver6.3

Purpose

The purpose of the proposed procedure is to enhance the current conventional OAK MADWIN and OAK MANTECA STARs (Figure 1) and address the following items identified by the NorCal OAPM Study and Design Teams:

- Flight Tracks do not follow published route.
- Lack of repeatable predictable flight paths.
- Optimization of lateral/vertical flight paths.
- Procedurally de-conflict from other area STARs.
- Efficient Cost to Carry (CTC) fuel planning.
- Use of Performance Based Navigation (PBN).
- Competing flight paths with other area procedures (MADN/WRAPS/MOD).

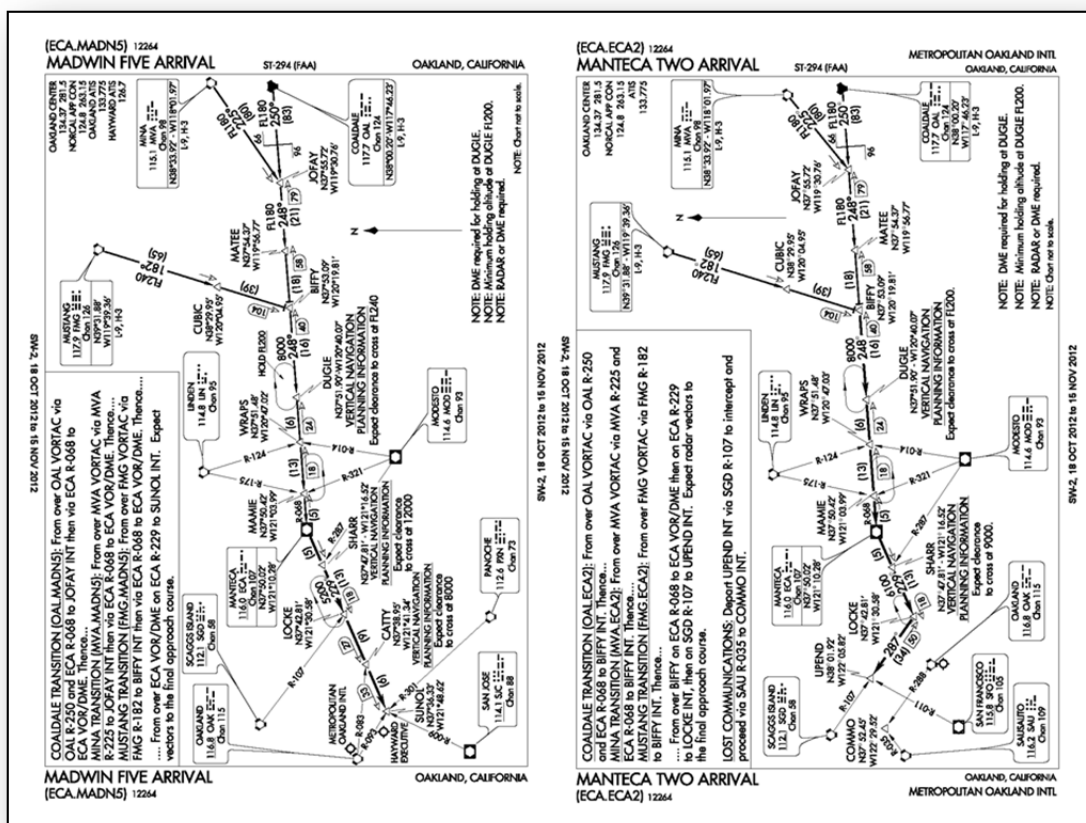


Figure 1: Current Procedures

Northern California (NorCal) OAPM Design Package

OAK OAKES STAR (formerly OAK MADWIN STAR and OAK MANTECA STAR)

NorCal OAK OAKES STAR Ver 6.3 OAK_OAKES_STAR_ver6.3

Study Team Recommendation

The NorCal OAPM Study Team made the following recommendations for improved redesign of OAK STARS:

- Provide procedural de-confliction from other procedures.
- Have predictable repeatable paths.
- Include OPD benefits.
- Align with current flight paths.
- Accommodate multiple approach transitions into OAK.
- Remove unused transitions.

Figure 2 illustrates the published procedure (solid red) and the Study Team proposed routes (dashed blue), as well as current tracks (pink).

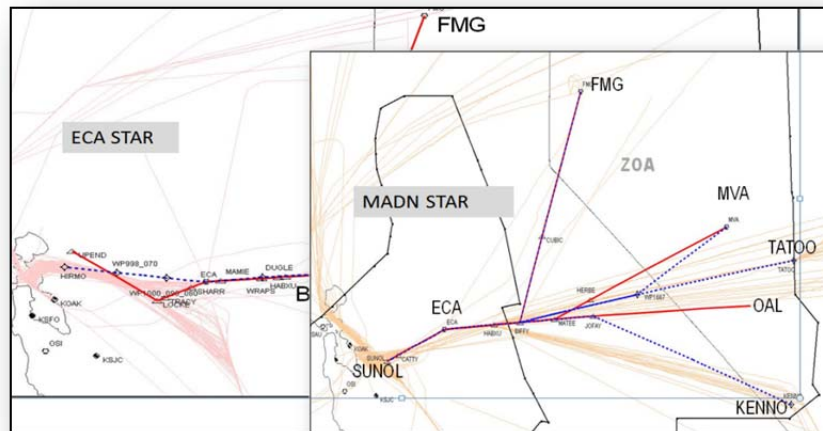


Figure 2: Study Team Recommendation

Northern California (NorCal) OAPM Design Package

OAK OAKES STAR (*formerly OAK MADWIN STAR and OAK MANTECA STAR*)

NorCal OAK OAKES STAR Ver 6.3 OAK_OAKES_STAR_ver6.3

Proposed Final Design

The NorCal OAPM Design Team is proposing a new procedure named the OAK OAKES STAR. This new design combines the OAK MADWIN and OAK MANTECA STARS into a single RNAV procedure. The current conventional OAK MADWIN and OAK MANTECA procedures will continue to be used by aircraft unable to utilize Performance Based Navigation (PBN) procedures.

The new OAK OAKES STAR is illustrated in Figure 3. The new design elements and benefits include:

- Offers new transitions from INSLO, TATOO, MRLET, and RUSME waypoints. These new entry points will be used to procedurally de-conflict the proposed OAK STAR from redesigned SFO and SJC RNAV STARS.
- Removes the unused FMG transition.
- Reno departures routed to the Oakland Airport will utilize the MRLET transition.
- Use of Performance Based Navigation (PBN).
- Optimization of lateral/vertical flight paths.
- Elimination of ground based Navaid dependency.
- Predictable and repeatable flight tracks.
- Reduction in controller workload and controller/pilot transmissions.
- Efficient Cost to Carry (CTC) fuel planning.

Northern California (NorCal) OAPM Design Package

OAK OAKES STAR (formerly OAK MADWIN STAR and OAK MANTECA STAR)

NorCal OAK OAKES STAR Ver 6.3 OAK_OAKES_STAR_ver6.3

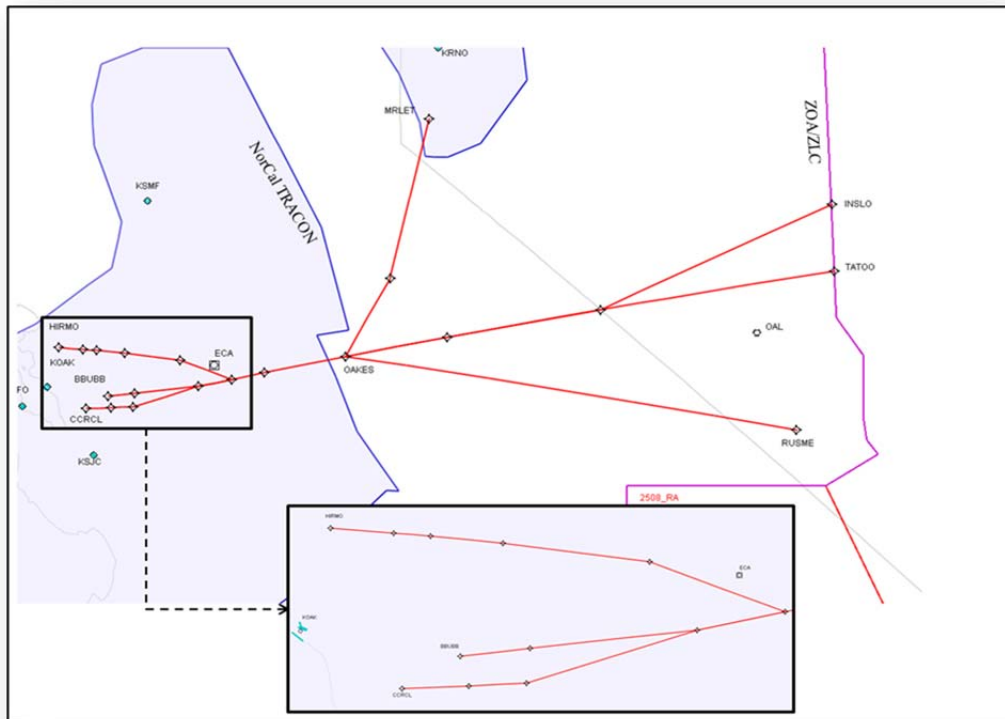


Figure 1: Proposed Final Design

The OAK OAKES STAR design differences include:

- The NorCal Design Team changed the NorCal Study Team recommendation by combining the OAK MADN and OAK ECA STARS, thereby allowing for a single arrival procedure to be used for either the OAK West Plan configuration operation (Runway 27 or 29)¹ or the OAK South East Plan configuration operation (Runway 11)².
- The Design Team increased the number of en route transitions from three to four in comparison to the Study Team recommendation, allowing for increased flexibility and efficiency.
- Multiple RNP Approaches to Oakland East Runways were not included by the Design Team.

¹ Due to a magnetic variation adjustment effective October 2013, Runway 29 and 27 will be renamed Runway 30 and 28 respectively.

² Due to a magnetic variation adjustment, effective October 2013 Runway 11 will be renamed Runway 12.

Northern California (NorCal) OAPM Design Package

OAK OAKES STAR *(formerly OAK MADWIN STAR and OAK MANTECA STAR)*

NorCal OAK OAKES STAR Ver 6.3 OAK_OAKES_STAR_ver6.3

Additional Design Considerations

Validation of the proposed design has been accomplished through Human-in-the-Loop (HITL) simulations.

The proposed changes do not require a spectrum analysis.

Implementation Dependencies

The OAK OAKES STAR is **dependent** on other proposed designs that are located in the same geographic area east of the San Francisco Bay. These proposed designs are:

- SMF SUUTR STAR.
- NCT Internal Airspace change.

The OAK OAKES RNAV STAR is recommended to be implemented with the NCT Internal Airspace change and the SMF SUUTR procedure.

This proposed design requires amendments/modifications to:

- NCT West and East Plan Airspace.
- ZOA Sector 34 Airspace Shelf.
- ZOA and NCT Standard Operating Procedures (SOP).
- ZOA/ZLA, ZOA/ZLC, ZOA/NCT Letters of Agreement (LOA).
- Automation.

No additional staffing, facilities or equipment is anticipated for this proposed design.

Attachments

Terminal Procedures:

- TARGETS Distribution Package.
- Flight Simulator Worksheet.
- RNAV Pro analysis results.
- HITL Documentation.

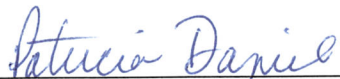
Northern California (NorCal) OAPM Design Package

OAK OAKES STAR (formerly OAK MADWIN STAR and OAK MANTECA STAR)

NorCal OAK OAKES STAR Ver 6.3.docx OAK_OAKES_STAR_ver6.3

Review Signatures


The D&I Team reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.



Patricia Daniel, FAA Lead
Northern California OAPM

1-24-13

Date



Steven Hefley, NATCA Lead
Northern California OAPM

1-24-13

Date



John F. Fisher, Facility POC
Oakland ARTCC

1/24/13


Date



Robert Newray, NATCA POC
Oakland ARTCC

1/24/13

Date



Paul Pegadiotes, Facility POC
Northern California TRACON

1/24/13

Date



Richard Hull, NATCA POC
Northern California TRACON

1/24/13

Date

Northern California (NorCal) OAPM Design Package

OAK WNSDR STAR (formerly OAK RAIDR STAR)

NorCal OAK WNSDR STAR Ver 6.3 OAK_WNSDR_STAR_ver6.3

Name of Change	Date
OAK WNSDR STAR	12/21/2012
Change Classification	Current Phase of Design
Terminal Procedure STAR	<input type="checkbox"/> Preliminary Design (PD) <input type="checkbox"/> Operational Design (OD) <input type="checkbox"/> Operational Design Complete (ODC) <input checked="" type="checkbox"/> Proposed Final Design (PFD)
OAPM Study Team Reference(s)	Implementation Date
4.6.2.2	2014
Affected Facilities and Positions, Areas, and/or Sectors	Facility Points of Contact
Oakland ARTCC (ZOA): Sectors: 31-Red Bluff High 36-Mendocino High 40 41 Northern California TRACON (NCT): Area C – Mulford Grove Area D – Richmond, Diablo	ZOA: James Meadows 510-745-3469 Robert Newray 510-918-6859 NCT: Paul Pegadiotes 916-366-4048 Richard Hull 916-201-3206
Related/Dependent Submissions	Associated Data Files
NCT West and East Plan Airspace Change	Master TARGETS File

Purpose

The purpose of the proposed procedure is to enhance the current conventional OAK RAIDR STAR (Figure 1) and address the following items identified by the NorCal OAPM Study and Design Teams:

- Flight Tracks do not follow published route.
- Lack of repeatable predictable flight paths.
- Optimization of lateral/vertical flight paths.
- Procedurally de-conflict from other area STARs.
- Efficient Cost to Carry (CTC) fuel planning.
- Use of Performance Based Navigation (PBN).

Northern California (NorCal) OAPM Design Package

OAK WNSDR STAR (formerly OAK RAIDR STAR)

NorCal OAK WNSDR STAR Ver 6.3 OAK_WNSDR_STAR_ver6.3

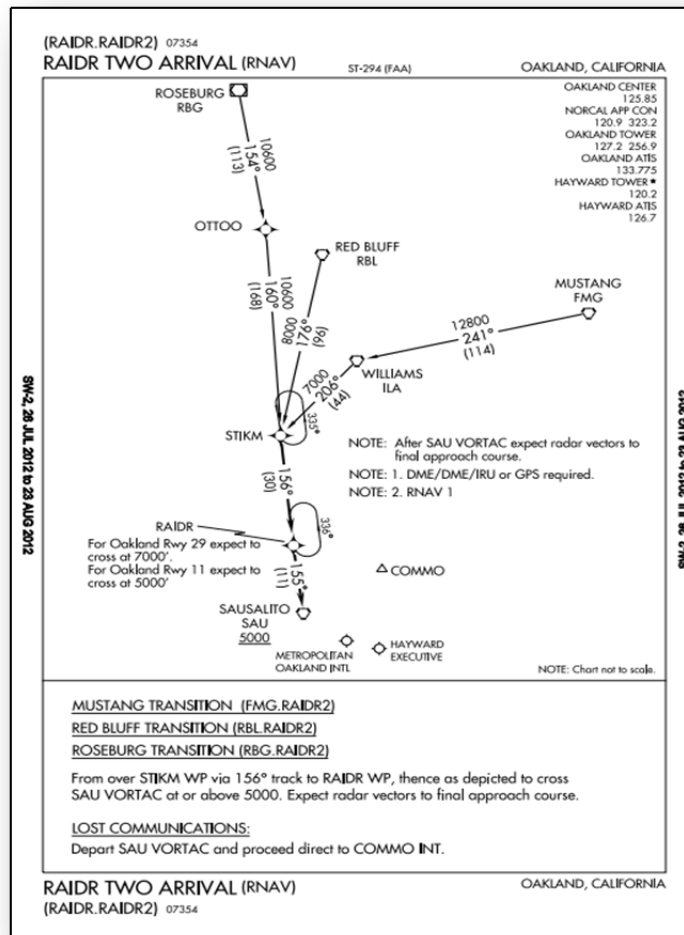


Figure 1: Current Procedure

Study Team Recommendation

The NorCal OAPM Study Team made the following recommendations for improved redesign of OAK STARS:

- Develop a modified RNAV STAR with OPD benefits.
- Defines a predictable, repeatable path.
- Align with currently flown lateral flight paths.
- Accommodate multiple approach transitions.
- Better positioning of aircraft for visual approaches.

Northern California (NorCal) OAPM Design Package

OAK WND SR STAR (formerly OAK RAIDR STAR)

NorCal OAK WND SR STAR Ver 6.3 OAK_WND SR STAR_ver6.3

Figure 2 illustrates the published procedure (solid red) and the Study Team proposed routes (dashed blue), as well as current tracks (pink).

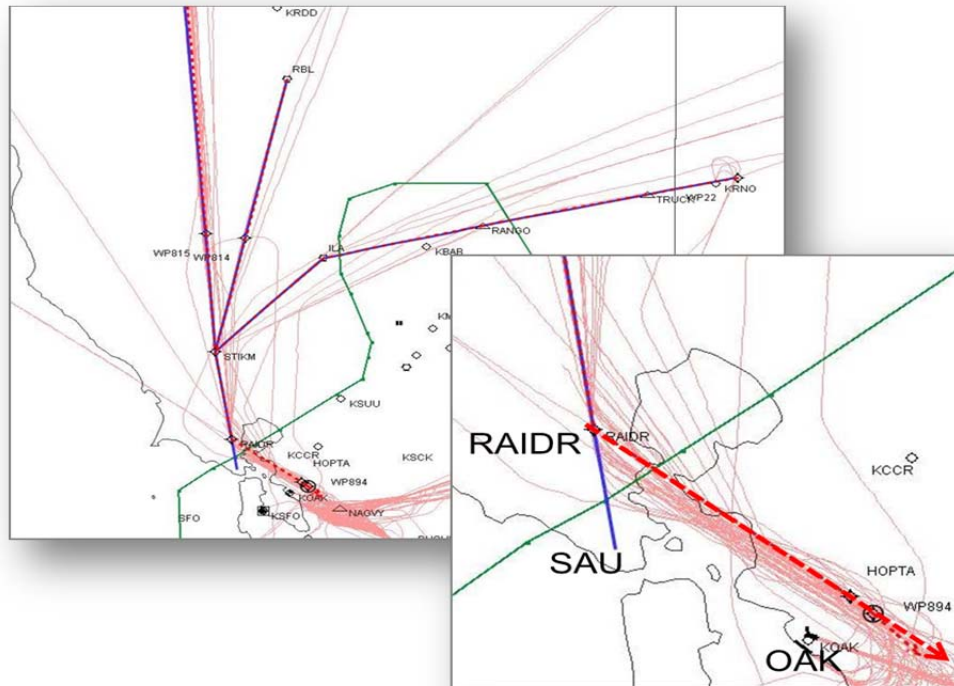


Figure 2: Study Team Recommendation

Proposed Final Design

The NorCal Design Team is proposing a new RNAV procedure named the OAK WND SR STAR (Figure 3). The current OAK RAIDR STAR will continue to be used by aircraft unable to utilize Performance Based Navigation (PBN) procedures. The new design elements and benefits include:

- Improved Performance-Based Navigation (PBN) procedure for OAK.
- Use of Performance Based Navigation (PBN).
- Optimization of lateral/vertical flight paths.
- Elimination of ground based Navaid dependency.
- Predictable and repeatable flight tracks.
- Reduction in controller workload and controller/pilot transmissions.
- Efficient Cost to Carry (CTC) fuel planning.

Northern California (NorCal) OAPM Design Package

OAK WND SR STAR (formerly OAK RAIDR STAR)

NorCal OAK WND SR STAR Ver 6.3 OAK_WND SR_STAR_ver6.3

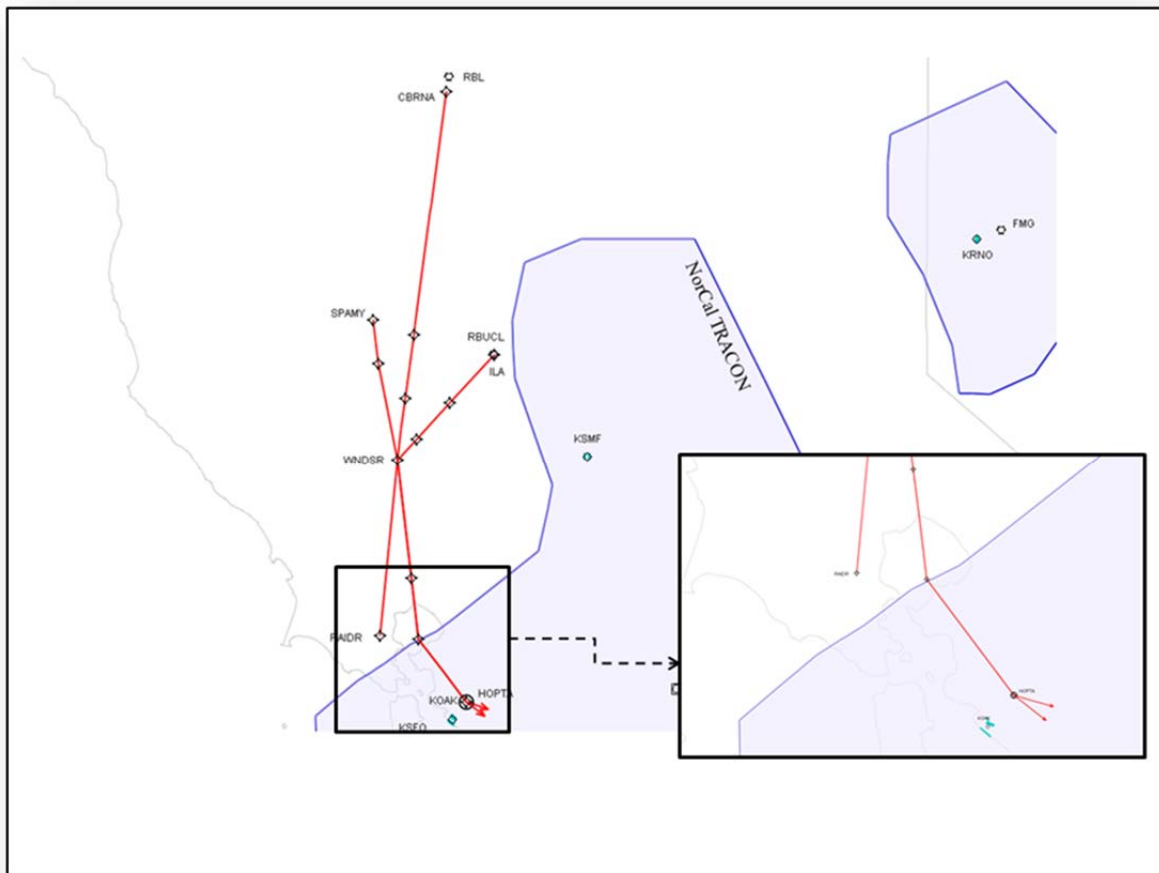


Figure 3: Proposed Procedure

The proposed OAK WND SR STAR design differences include:

- Procedure can be used during OAK West and East Plan Configurations.
- Procedure provides published holding pattern for East and West Plan Configurations.
- Reduction in mileage flown.
- Procedurally de-conflicted from Travis approach airspace and Napa (APC) traffic.
- Procedurally de-conflicted from SFO and SJC arrival flows.
- Procedurally de-conflicted from the SFO and OAK departure flows.
- Procedure will eliminate excessive vectoring therefore multiple RNP approach transitions were deemed unnecessary.

Northern California (NorCal) OAPM Design Package

OAK WND SR STAR *(formerly OAK RAIDR STAR)*

NorCal OAK WND SR STAR Ver 6.3 OAK_WND SR_STAR_ver6.3

Additional Design Considerations

Validation of the proposed design has been accomplished through Human-in-the-Loop (HITL) simulations.

The proposed changes do not require a spectrum analysis.

Implementation Dependencies

Although the OAK WND SR STAR it is not dependent on any proposed designs and can be submitted separately as soon as practical for action/processing.

This proposed design requires amendments/modifications to:

- IAF to the OAK RNP Rwy 29¹ from RAIDR to HOPTA.
- ZOA and NCT Standard Operating Procedures (SOP).
- ZSE/ZOA, ZLC/ZOA and ZOA/NCT Letters of Agreement (LOA).
- NCT West and East Plan Airspace.

No additional staffing, facilities or equipment is anticipated for this proposed design.

Attachments

Terminal Procedures:

- TARGETS Distribution Package.
- Flight Simulator Worksheet.
- RNAV Pro analysis results.
- HITL Documentation.

¹ Due to a magnetic variation adjustment effective October 2013, Runway 29 will be renamed Runway 30.

Northern California (NorCal) OAPM Design Package

OAK WNSDR STAR (formerly OAK RAIDR STAR)

NorCal OAK WNSDR STAR Ver 6.3.docx OAK_WNSDR_STAR_ver6.3

Review Signatures

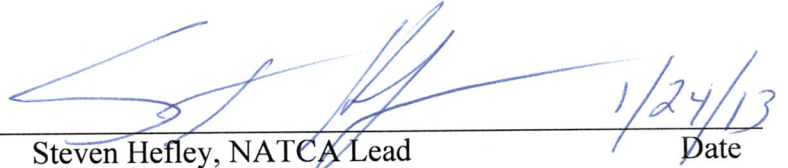
The D&I Team reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.



Patricia Daniel, FAA Lead
Northern California OAPM

1-24-13

Date



Steven Hefley, NATCA Lead
Northern California OAPM

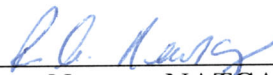
1/24/13
Date



John F. Fisher, Facility POC
Oakland ARTCC

1/24/13

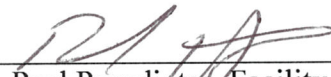
Date



Robert Newray, NATCA POC
Oakland ARTCC

1/24/13

Date



Paul Pegadiotes, Facility POC
Northern California TRACON

1/24/13

Date



Richard Hull, NATCA POC
Northern California TRACON

1/24/13

Date

Northern California (NorCal) OAPM Design Package

SFO BDEGA STAR (formerly SFO GOLDN GATE STAR)

NorCal SFO_BDEGA_STAR_Ver 6.3 SFO_BDEGA_STAR_ver6.3

Name of Change	Date
SFO BDEGA STAR	12/21/2012
Change Classification	Current Phase of Design
Terminal Procedure STAR	<input type="checkbox"/> Preliminary Design (PD) <input type="checkbox"/> Operational Design (OD) <input type="checkbox"/> Operational Design Complete (ODC) <input checked="" type="checkbox"/> Proposed Final Design (PFD)
OAPM Study Team Reference(s)	Implementation Date
4.5.2.2	2014
Affected Facilities and Positions, Areas, and/or Sectors	Facility Points of Contact
Oakland ARTCC (ZOA): Sectors: 31-Red Bluff High, 36-Mendocino High 41 Northern California TRACON (NCT): Sectors: Sutro Boulder	ZOA: James Meadows 510-745-3469 Robert Newray 510-918-6859 NCT: Paul Pegadiotes 916-366-4048 Richard Hull 916-201-3206
Related/Dependent Submissions	Associated Data Files
NCT West Plan Airspace Change	Master Targets File

Purpose

The purpose of the proposed procedure is to enhance the current conventional SFO GOLDN GATE STAR (Figure 1) and address the following items identified by the NorCal OAPM Study and Design Teams:

- Flight Tracks do not follow published route.
- Lack of repeatable predictable flight paths.
- Optimization of lateral/vertical flight paths.
- Procedurally de-conflict from other area STARs.
- Efficient Cost to Carry (CTC) fuel planning.
- Use of Performance Based Navigation (PBN).
- San Francisco (SFO) and San Jose (SJC) Airports share the GOLDN STAR.

Northern California (NorCal) OAPM Design Package

SFO BDEGA STAR (formerly SFO GOLDN GATE STAR)

NorCal SFO_BDEGA_STAR_Ver 6.3 SFO_BDEGA_STAR_ver6.3

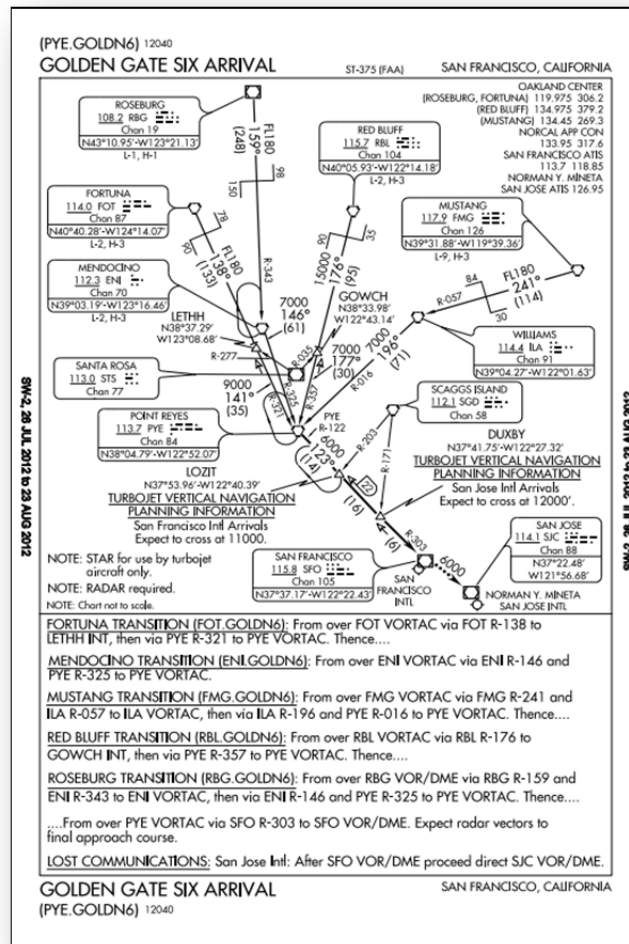


Figure 1: Current Procedure

Study Team Recommendation

The NorCal OAPM Study Team made the following recommendations for improved design of SFO STARS:

- Design a new RNAV STAR to SFO from the north.
- Design RNAV STARS with OPD benefits.
- Provide separate RNAV procedure for SJC.
- Design a new RNAV STAR which includes a runway transition to SFO Runway 28R.
- Have predictable, repeatable paths.

Northern California (NorCal) OAPM Design Package

SFO BDEGA STAR (formerly SFO GOLDN GATE STAR)

NorCal SFO_BDEGA_STAR_Ver 6.3 SFO_BDEGA_STAR_ver6.3

- Procedurally de-conflicted from other area arrivals.
- Align with current flight paths.
- Eliminate unused transitions.

Figure 2 illustrates the current published procedure (solid red) and the Study Team proposed routes (dashed blue), as well as current tracks (pink).

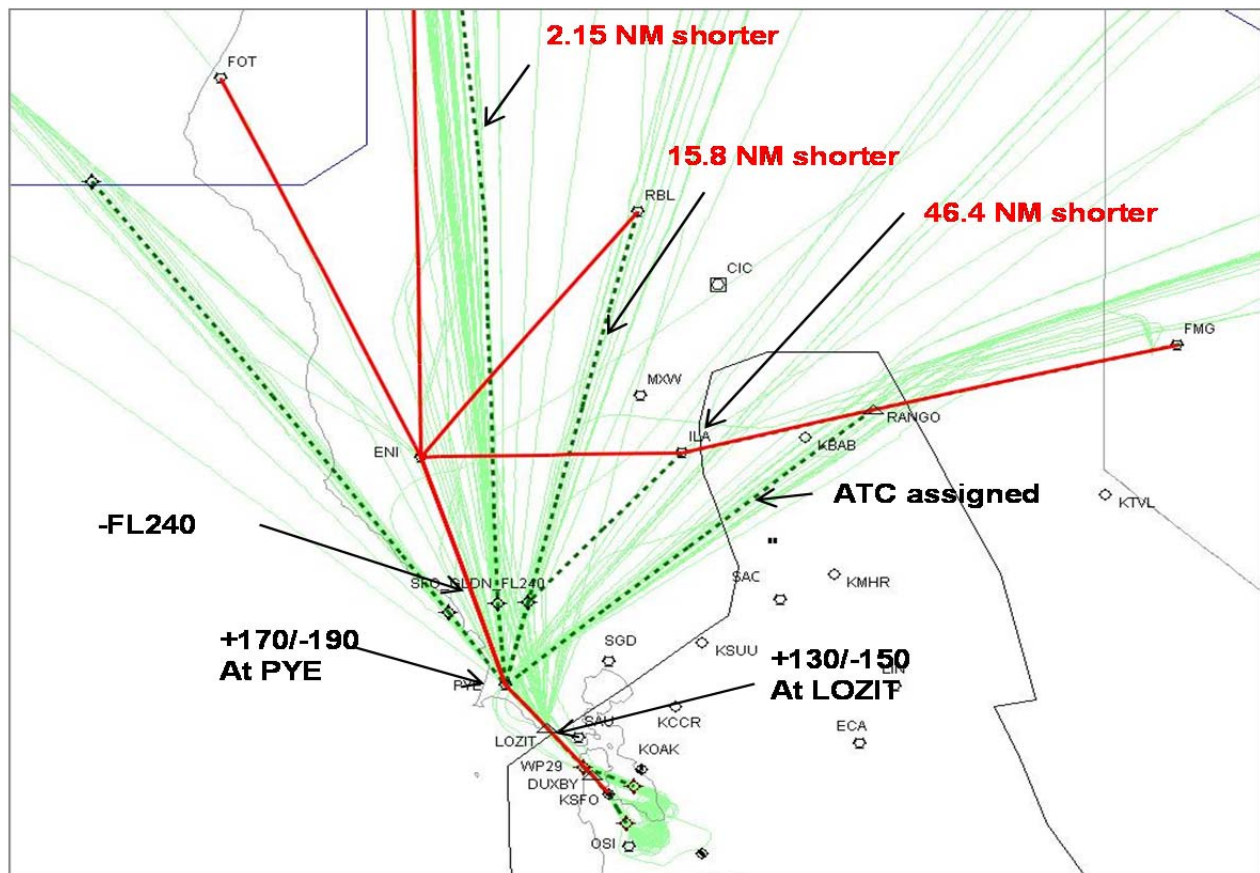


Figure 2: Study Team Recommendation

Northern California (NorCal) OAPM Design Package

SFO BDEGA STAR (formerly SFO GOLDN GATE STAR)

NorCal SFO_BDEGA_STAR_Ver 6.3 SFO_BDEGA_STAR_ver6.3

Proposed Final Design

The NorCal Design Team is proposing the creation of a new Performance-Based Navigation (PBN) procedure named the SFO BDEGA STAR. The current conventional SFO GOLDN GATE STAR will continue to be used by aircraft unable to utilize Performance Based Navigation (PBN) procedures.

The SFO BDEGA STAR (Figure 3) was designed to be procedurally de-conflicted from arrival traffic to Oakland Airport (OAK) on the new RNAV OAK WNDSR STAR, and from arrival traffic to San Jose Airport (SJC) on the new RNAV SJC BRXXX STAR. The new design elements and benefits include:

- Use of Performance Based Navigation (PBN).
- Optimization of lateral/vertical flight paths.
- Elimination of ground based Navaid dependency.
- Predictable and repeatable flight tracks.
- Reduction in controller workload and controller/pilot transmissions.
- Efficient Cost to Carry (CTC) fuel planning.
- Runway transitions for Runway 28L and 28R.
- Additional holding pattern has been created at BGGLO.

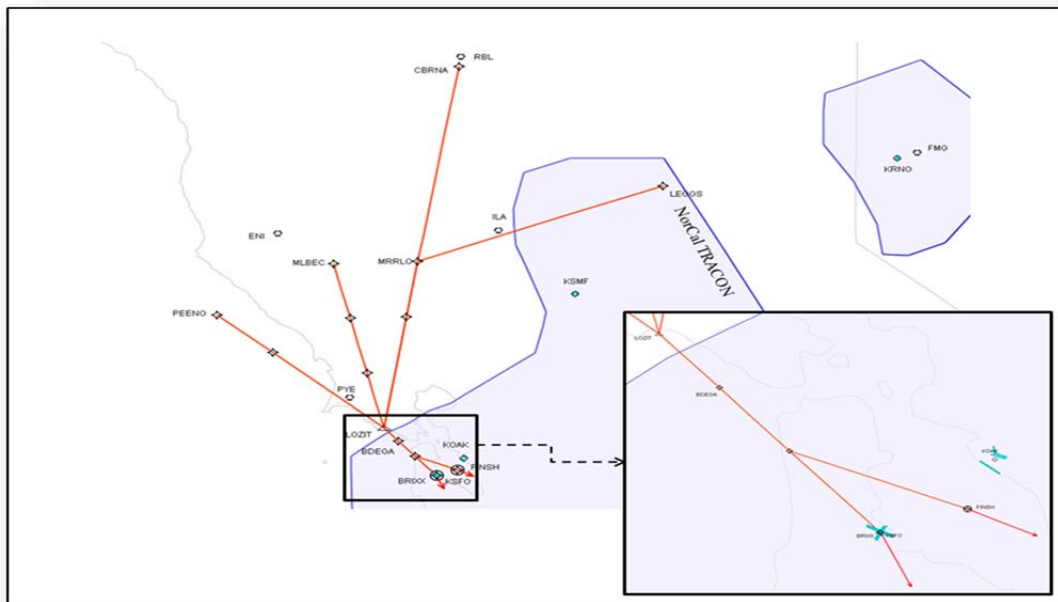


Figure 1: Proposed Procedure

Northern California (NorCal) OAPM Design Package

SFO BDEGA STAR (*formerly SFO GOLDN GATE STAR*)

NorCal SFO_BDEGA_STAR_Ver 6.3 SFO_BDEGA_STAR_ver6.3

Design differences from the Study team recommendation include:

- The elimination of the PYE VOR from the new RNAV procedure.
- Routing via LOZIT intersection, resulting in a reduction of flying miles as compared to both the current procedure and Study Recommendation.

Additional Design Considerations

Validation of the proposed design has been accomplished through Human-in-the-Loop (HITL) simulations.

The proposed changes do not require a spectrum analysis.

Implementation Dependencies

The SFO BDEGA RNAV STAR was designed to be procedurally de-conflicted from both the proposed OAK WND SR STAR and the SJC BRIXX STAR. The SFO BDEGA STAR is not dependent on any other proposed designs and can be submitted separately from all other proposed designs and as soon as practical for action/processing.

This proposed design requires amendments/modifications to:

- ZOA and NCT Standard Operating Procedures (SOPs).
- ZOA/ZSE, ZOA/ZLC and ZOA/NCT Letter of Agreement (LOA).
- Automation.
- NCT West Plan Airspace.

No additional staffing, facilities or equipment is anticipated for this proposed design.

Attachments

Terminal Procedures:

- TARGETS Distribution Package.
- Flight Simulator Worksheet.
- RNAV Pro analysis.
- HITL simulation results.

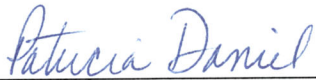
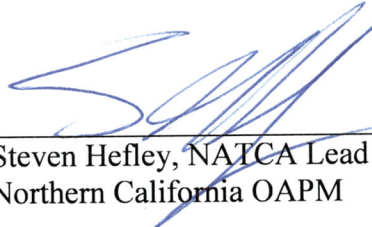




Northern California (NorCal) OAPM Design Package

SFO BDEGA STAR (formerly SFO GOLDN GATE STAR)

NorCal SFO BDEGA STAR Ver 6.3.docx SFO_BDEGA_STAR_ver6.3

Review Signatures

The D&I Team reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

 Patricia Daniel, FAA Lead Northern California OAPM	<u>1/24/13</u> Date	 Steven Hefley, NATCA Lead Northern California OAPM	<u>1/24/13</u> Date
 John F. Fisher, Facility POC Oakland ARTCC	<u>1/24/13</u> Date	 Robert Newray, NATCA POC Oakland ARTCC	<u>1/24/13</u> Date
 Paul Pegadiotes, Facility POC Northern California TRACON	<u>1/24/13</u> Date	 Richard Hull, NATCA POC Northern California TRACON	<u>1/24/13</u> Date

Northern California OAPM Design Package

SFO CIITY RNAV DP (formerly SFO DUMBARTON SID)

NorCal Design Team Reference: SFO_CIITY_DP_Ver6.3

Name of Change	Date
SFO CIITY RNAV DP	12/21/2012
Change Classification	Current Phase of Design
Terminal Procedure DP	<input type="checkbox"/> Preliminary Design (PD) <input type="checkbox"/> Operational Design (OD) <input type="checkbox"/> Operational Design Complete (ODC) <input checked="" type="checkbox"/> Proposed Final Design (PFD)
OAPM Study Team Reference(s)	Implementation Date
None	2014
Affected Facilities and Positions, Areas, and/or Sectors	Facility Points of Contact
Oakland ARTCC (ZOA): Sectors: 29-Linden High 31-Red Bluff 41 Northern California TRACON (NCT): Sectors: Richmond Sutro Fairfield San Francisco Tower (SFO)	ZOA: James Meadows 510-745-3469 Robert Newray 510-918-6859 NCT: Paul Pegadiotes 916-366-4048 Richard Hull 916-201-3206 SFO: Mark Paulus 650-876-2883 X108 David Caldwell 209-602-1834
Related/Dependent Submissions	Associated Data Files
NCT East Plan Airspace Change	Master Targets File

Purpose

The purpose of the proposed procedure is to enhance the current conventional SFO DUMBARTON SID (Figure 1) and address the following items identified by the NorCal OAPM Design Team for SFO departures:

- Flight Tracks do not follow published route.
- Lack of repeatable predictable flight paths.
- Efficient Cost to Carry (CTC) fuel planning.
- Optimization of lateral/vertical flight paths.
- Use of Performance Based Navigation (PBN).

Northern California OAPM Design Package

SFO CITY RNAV DP (formerly SFO DUMBARTON SID)

NorCal Design Team Reference: SFO_CITY_DP_Ver6.3

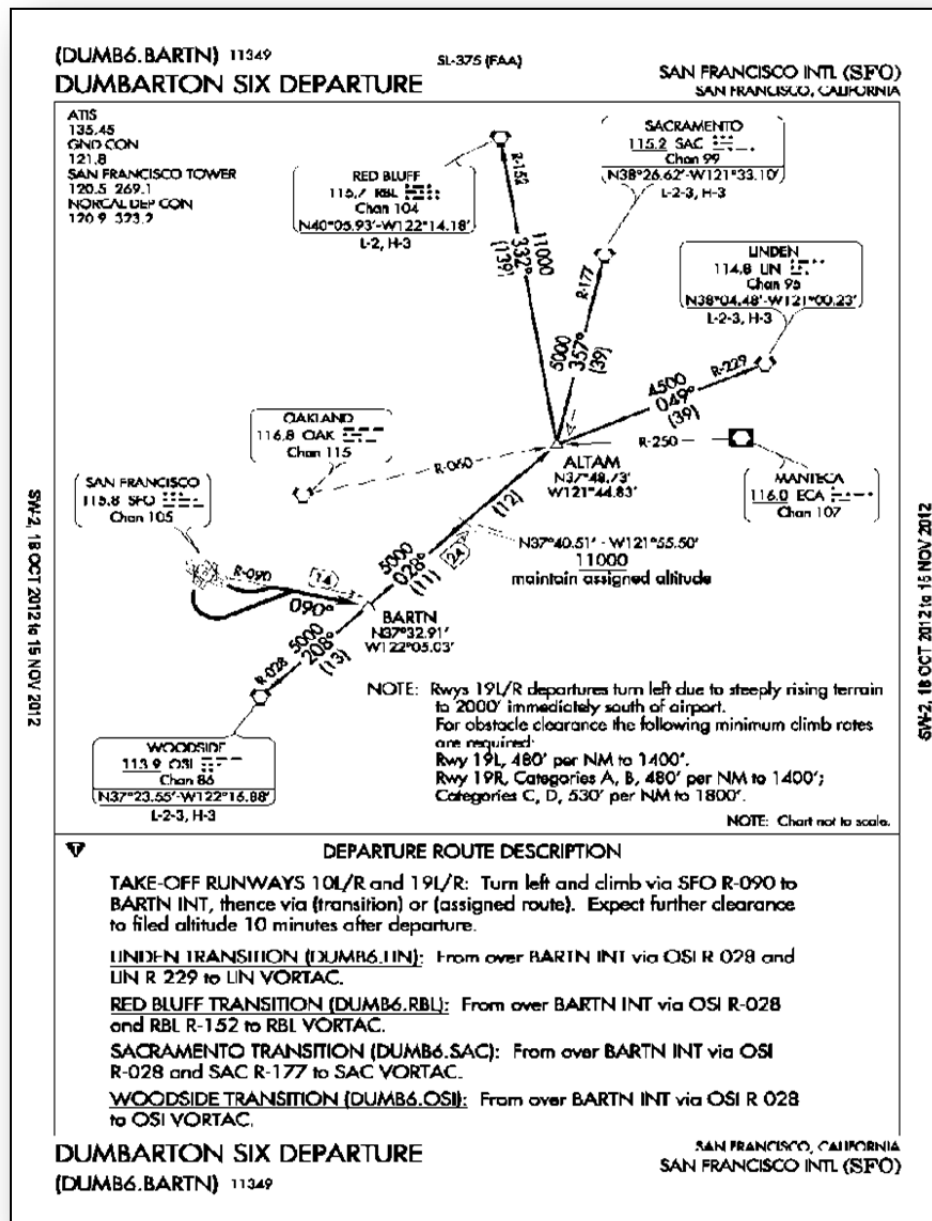


Figure 1: Current Procedure

Study Team Recommendation

Northern California OAPM Design Package

SFO CIITY RNAV DP (formerly SFO DUMBARTON SID)

NorCal Design Team Reference: SFO_CIITY_DP_Ver6.3

The NorCal Study Team did not provide recommendation on this particular procedure, however after further analysis the NorCal Design Team proposed a new procedure to optimize and add efficiency to current operations.

Proposed Final Design

The NorCal Design Team is proposing the creation of a new RNAV procedure for SFO Runways 10 and 19 departures to be named the SFO CIITY RNAV DP. The current conventional SFO DUMBARTON SID will continue to be used by aircraft unable to utilize Performance Based Navigation (PBN) procedures.

The new SFO CIITY RNAV DP is illustrated in Figure 2. The design elements and benefits include:

- Use of Performance Based Navigation (PBN).
- Optimization of lateral flight paths.
- Elimination of ground based Navaid dependency.
- Predictable and repeatable flight tracks.
- Reduction in controller workload and controller/pilot transmissions.
- Efficient Cost to Carry (CTC) fuel planning.
- En route departure transitions were increased from four to five.
- The Oceanic departures will continue to utilize the Dumbarton SID.
- Designed to allow simultaneous departure operations with the FOGGG DP off SFO runways 10L and 10R.
- Routes are designed to maximize efficiencies utilizing expanded terminal to en route transitional separation (3 NM increasing to 5 NM).

Northern California OAPM Design Package

SFO CIITY RNAV DP (formerly SFO DUMBARTON SID)

NorCal Design Team Reference: SFO_CIITY_DP_Ver6.3

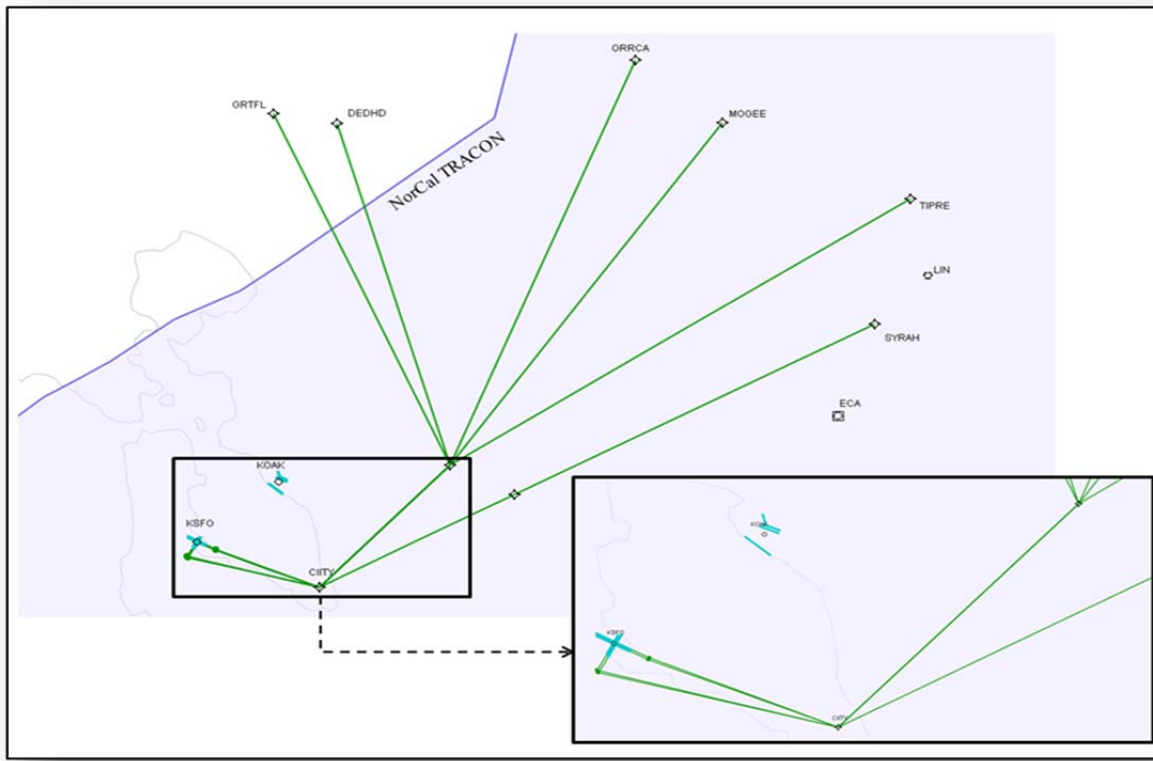


Figure 2: Proposed Procedure

Additional Design Considerations

Validation of the proposed design has been accomplished through Human-in-the-Loop (HITL) simulations.

The proposed changes do not require a spectrum analysis.

Implementation Dependencies

The SFO CIITY RNAV DP is not dependent on any other proposed designs and can be submitted separately as soon as practical for action/processing.

This proposed design requires amendments/modifications to:

- ZOA, NCT, and SFO Standard Operating Procedures (SOP).

Northern California OAPM Design Package

SFO CIITY RNAV DP (formerly SFO DUMBARTON SID)

NorCal Design Team Reference: SFO_CIITY_DP_Ver6.3

- ZOA/NCT and NCT/SFO Letters of Agreement (LOA).
- Automation.
- NCT East Plan Airspace.

No additional staffing, facilities or equipment is anticipated for this proposed design.

Attachments

Terminal Procedures:

- TARGETS Distribution Package.
- Flight Simulator Worksheet.
- RNAV Pro analysis results.
- HITL Documentation.


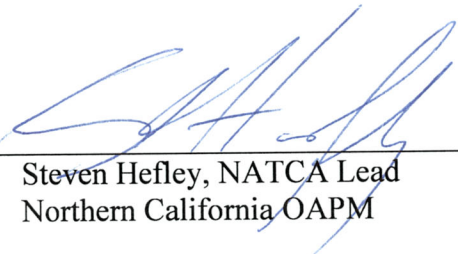
Northern California OAPM Design Package


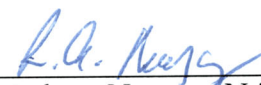
SFO CIITY RNAV DP (formerly SFO DUMBARTON SID)



NorCal Design Team Reference: SFO_CIITY_DP_Ver6.3


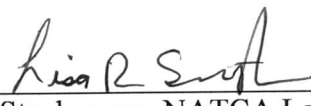
Review Signatures

The D&I Team reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

	1-24-13		1/24/13
Patricia Daniel, FAA Lead Northern California OAPM	Date	Steven Hefley, NATCA Lead Northern California OAPM	Date

	1/24/13		1/24/13
John F. Fisher, Facility POC Oakland ARTCC	Date	Robert Newray, NATCA POC Oakland ARTCC	Date

	1/24/13		1/24/13
Paul Pegadiotes, Facility POC Northern California TRACON	Date	Richard Hull, NATCA POC Northern California TRACON	Date

	1/17/13		1-17-13
Mark Paulus, Facility Lead San Francisco Tower	Date	Lisa Stephenson, NATCA Lead San Francisco Tower	Date

Northern California (NorCal) OAPM Design Package

SFO DYAMD STAR (formerly SFO MODESTO STAR and SFO LOCKE STAR)

NorCal SFO_DYAMD_STAR_Ver 6.3 SFO_DYAMD_STAR_ver6.3

Name of Change	Date
SFO DYAMD STAR	12/21/2012
Change Classification	Current Phase of Design
Terminal Procedure STAR	<input type="checkbox"/> Preliminary Design (PD) <input type="checkbox"/> Operational Design (OD) <input type="checkbox"/> Operational Design Complete (ODC) <input checked="" type="checkbox"/> Proposed Final Design (PFD)
OAPM Study Team Reference(s)	Implementation Date
4.5.2.1	2014
Affected Facilities and Positions, Areas, and/or Sectors	Facility Points of Contact
Oakland ARTCC (ZOA): Sectors: 15-Clovis High 16 22 29-Linden High 30-Mina High 32 33-Coaldale High 34-Modesto High 45 46 Northern California TRACON (NCT): Sectors: Cedar Sunol Niles	ZOA: James Meadows 510-745-3469 Robert Newray 510-918-6859 NCT: Paul Pegadiotes 916-366-4048 Richard Hull 916-201-3206
Related/Dependent Submissions	Associated Data Files
NCT West and East Plan Airspace Changes	Master Targets File
SMF SUUTR STAR	

Purpose

Northern California (NorCal) OAPM Design Package
SFO DYAMD STAR (formerly SFO MODESTO STAR and SFO LOCKE STAR)
 NorCal SFO DYAMD STAR Ver 6.3 SFO DYAMD STAR ver6.3

The purpose of the proposed procedure is to enhance the current conventional SFO MODESTO and SFO LOCKE STARs (Figure 1) and address the following items identified by the NorCal OAPM Study and Design Teams:

- Flight Tracks do not follow published route.
- Lack of repeatable predictable flight paths.
- Optimization of lateral/vertical flight paths.
- Procedurally de-conflict from other area STARs.
- Efficient Cost to Carry (CTC) fuel planning.
- Use of Performance Based Navigation (PBN).

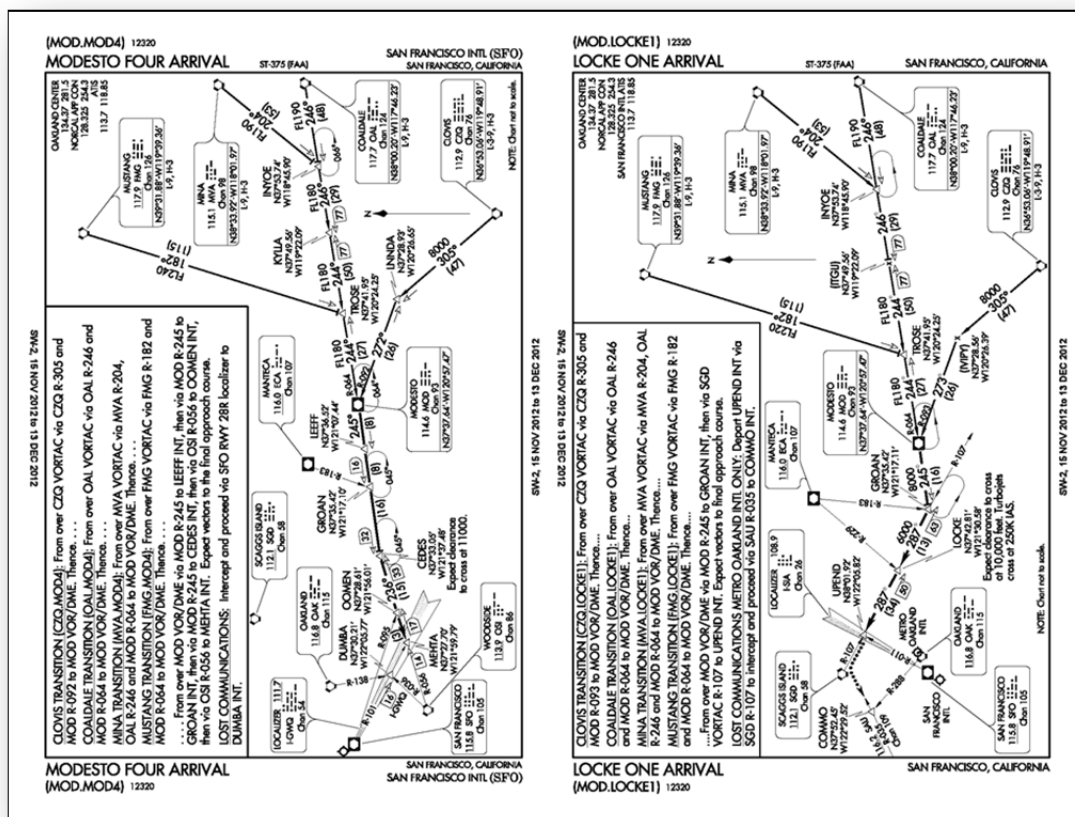


Figure 1: Current Procedure

Northern California (NorCal) OAPM Design Package

SFO DYAMD STAR (formerly SFO MODESTO STAR and SFO LOCKE STAR)

NorCal SFO_DYAMD_STAR_Ver 6.3 SFO_DYAMD_STAR_ver6.3

Study Team Recommendation

The NorCal OAPM Study Team made the following recommendations for improved redesign of SFO STARs:

- Segregation of the OAK and SJC arrival flows from the SFO MOD STAR arrival flows.
- Create OPD benefits.
- Align the lateral paths of the current traffic flows over the Coaldale (OAL) and Mina (MVA) transitions.
- A transition designed to facilitate Beatty (BTY) traffic from ZLA.
- Eliminate unused transitions: Clovis (CZQ) and Mustang (FMG).

Figure 2 illustrates the published procedure (solid red) and the proposed routes (dashed yellow), as well as current tracks (green).

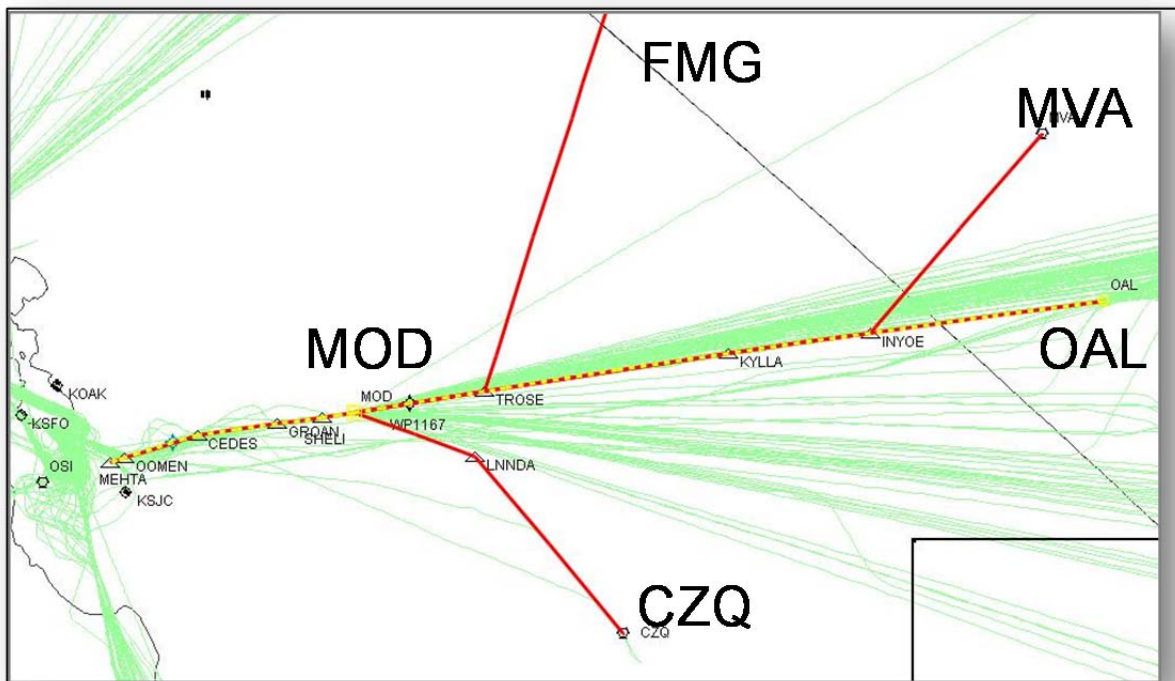


Figure 2: Study Team Recommendation

Northern California (NorCal) OAPM Design Package

SFO DYAMD STAR (formerly SFO MODESTO STAR and SFO LOCKE STAR)

NorCal SFO_DYAMD_STAR_Ver 6.3 SFO_DYAMD_STAR_ver6.3

Proposed Final Design

The NorCal Design Team is proposing the creation of a new procedure named the SFO DYAMD STAR. The SFO DYAMD STAR is a Performance-Based Navigation (PBN) optimization of the conventional SFO MOD STAR and the SFO LOCKE STAR. The current conventional SFO MODESTO and SFO LOCKE STARS will continue to be used by aircraft unable to utilize Performance Based Navigation (PBN) procedures.

The Design Team enhanced the Study Team recommendation by creating a single SFO STAR for both SFO runway 28 and 19 configurations. The new SFO DYAMD STAR is illustrated in Figure 3. Design elements and benefits include:

- Use of Performance Based Navigation (PBN).
- Optimization of lateral/vertical flight paths.
- Elimination of ground based Navaid dependency.
- Predictable and repeatable flight tracks.
- Reduction in controller workload and controller/pilot transmissions.
- Efficient Cost to Carry (CTC) fuel planning.
- Single STAR to accommodate SFO Runway 28 and 19 configurations.
- Ties in with the current ILS and FMS BRIJJ Visual approach procedures.

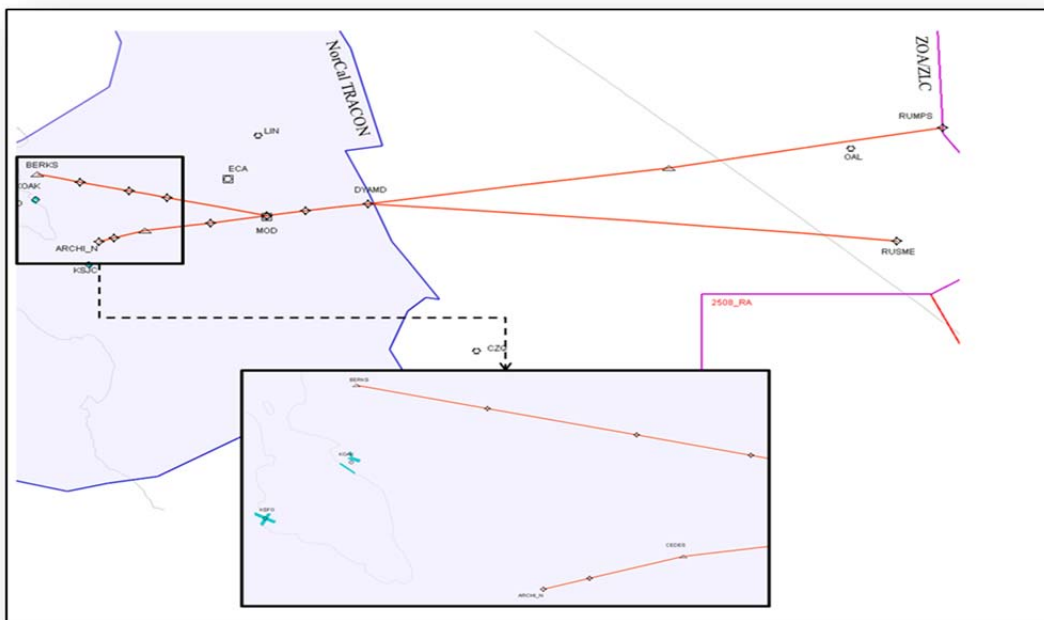


Figure 1: Proposed Procedure

Northern California (NorCal) OAPM Design Package

SFO DYAMD STAR (formerly SFO MODESTO STAR and SFO LOCKE STAR)

NorCal SFO_DYAMD_STAR_Ver 6.3 SFO_DYAMD_STAR_ver6.3

Additional Design Considerations

Validation of the proposed design has been accomplished through Human-in-the-Loop (HITL) simulations.

The proposed changes do not require a spectrum analysis.

Implementation Dependencies

The SFO DYAMD STAR is dependent on the SMF SUUTR STAR.

This proposed design requires amendments/modifications to:

- ZOA and NCT Standard Operating Procedures (SOP).
- ZOA/ZLC, ZOA/ZLA, ZOA/E10, and ZOA/ NCT Letters of Agreement (LOA).
- NCT West and East Plan airspace.

No additional staffing, facilities or equipment is anticipated for this proposed design.

Attachments

Terminal Procedures:

- TARGETS Distribution Package.
- Flight Simulator Worksheet.
- RNAV Pro analysis results.
- HITL simulation results.

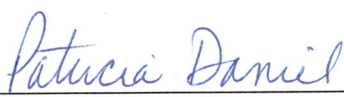
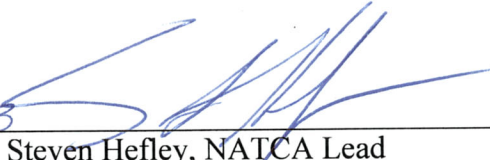


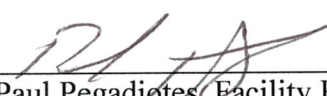
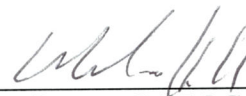
Northern California (NorCal) OAPM Design Package

SFO DYAMD STAR (formerly SFO MODESTO STAR and SFO LOCKE STAR)

NorCal SFO DYAMD STAR Ver 6.3.docx SFO_DYAMD_STAR_ver6.3

Review Signatures

The D&I Team reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

 Patricia Daniel, FAA Lead Northern California OAPM	 Steven Hefley, NATCA Lead Northern California OAPM
 John F. Fisher, Facility POC Oakland ARTCC	 Robert Newray, NATCA POC Oakland ARTCC
 Paul Pegadiotes, Facility POC Northern California TRACON	 Richard Hull, NATCA POC Northern California TRACON

Northern California (NorCal) OAPM Design Package

SFO FOGGG RNAV DP (formerly SFO DUMBARTON SID)

NorCal Design Team Reference: SFO_FOGGG_DP_ver6.3

Name of Change	Date
SFO FOGGG RNAV DP	12/21/2012
Change Classification	Current Phase of Design
Terminal Departure Procedure (DP)	<input type="checkbox"/> Preliminary Design (PD) <input type="checkbox"/> Operational Design (OD) <input type="checkbox"/> Operational Design Complete (ODC) <input checked="" type="checkbox"/> Proposed Final Design (PFD)
OAPM Study Team Reference(s)	Implementation Date
None	2014
Affected Facilities and Positions, Areas, and/or Sectors	Facility Points of Contact
Oakland ARTCC (ZOA): Sectors: 29-Linden High, 31-Red Bluff 41 Northern California TRACON (NCT): Sectors: Richmond Sutro Fairfield San Francisco Tower (SFO)	ZOA: James Meadows 510-745-3469 Robert Newray 510-918-6859 NCT: Paul Pegadiotes 916-366-4048 Richard Hull 916-201-3206 SFO: Mark Paulus 650-876-2883 X108 David Caldwell 209-602-1834
Related/Dependent Submissions	Associated Data Files
NCT East Plan Airspace Change	Master Targets File

Purpose

The purpose of the proposed procedure is to enhance the current conventional SFO DUMBARTON SID (Figure 1) and address the following items identified by the NorCal OAPM Design Team for SFO departures:

- Flight Tracks do not follow published route.
- Lack of repeatable predictable flight paths.
- Efficient Cost to Carry (CTC) fuel planning.
- Optimization of lateral/vertical flight paths.
- Use of Performance Based Navigation (PBN).

Northern California (NorCal) OAPM Design Package

SFO FOGGG RNAV DP (formerly SFO DUMBARTON SID)

NorCal Design Team Reference: SFO_FOGGG_DP_ver6.3

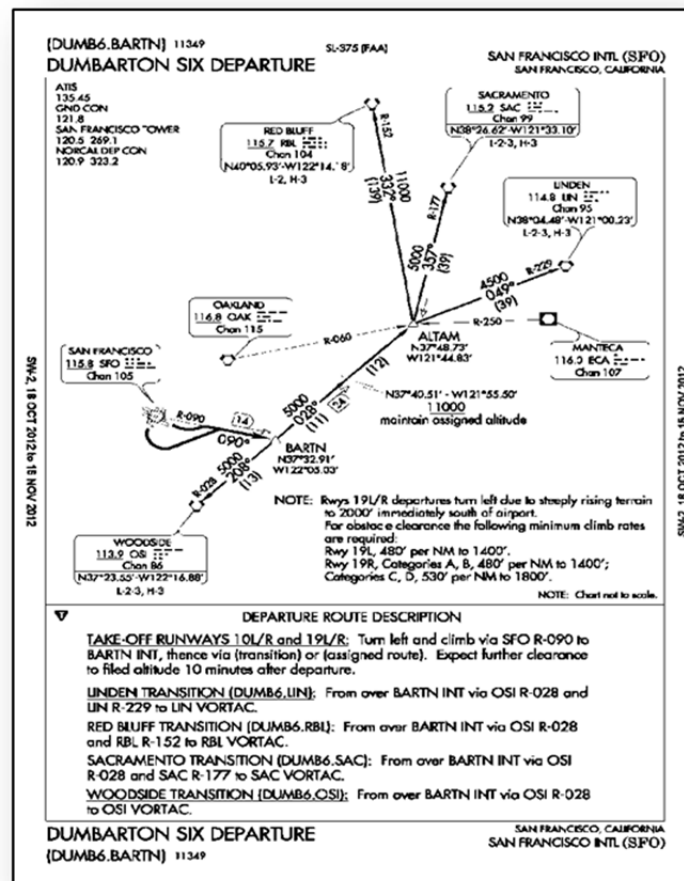


Figure 1: Current Procedure

Study Team Recommendation

The NorCal Study Team did not provide recommendation on this particular procedure, however after further analysis the NorCal Design Team proposed a new procedure to optimize and add efficiency to current operations.

Proposed Final Design

The NorCal Design Team is proposing the creation of the new RNAV SFO FOGGG procedure (Figure 2) for SFO Runway 10 and 19 departures. The current conventional SFO

Northern California (NorCal) OAPM Design Package

SFO FOGGG RNAV DP (formerly SFO DUMBARTON SID)

NorCal Design Team Reference: SFO_FOGGG_DP_ver6.3

DUMBARTON SID will continue to be used by aircraft unable to utilize Performance Based Navigation (PBN) procedures. The design elements and benefits include:

- Use of Performance Based Navigation (PBN).
- Optimization of lateral flight paths.
- Elimination of ground based Navaid dependency.
- Predictable and repeatable flight tracks.
- Reduction in controller workload and controller/pilot transmissions.
- Efficient Cost to Carry (CTC) fuel planning.
- En route departure transitions were increased from four to six.
- Allow simultaneous departure operations with the CIITY and SAHEY DP off SFO.
- Routes are designed to maximize efficiencies utilizing expanded terminal to en route transitional separation (3 NM increasing to 5 NM).

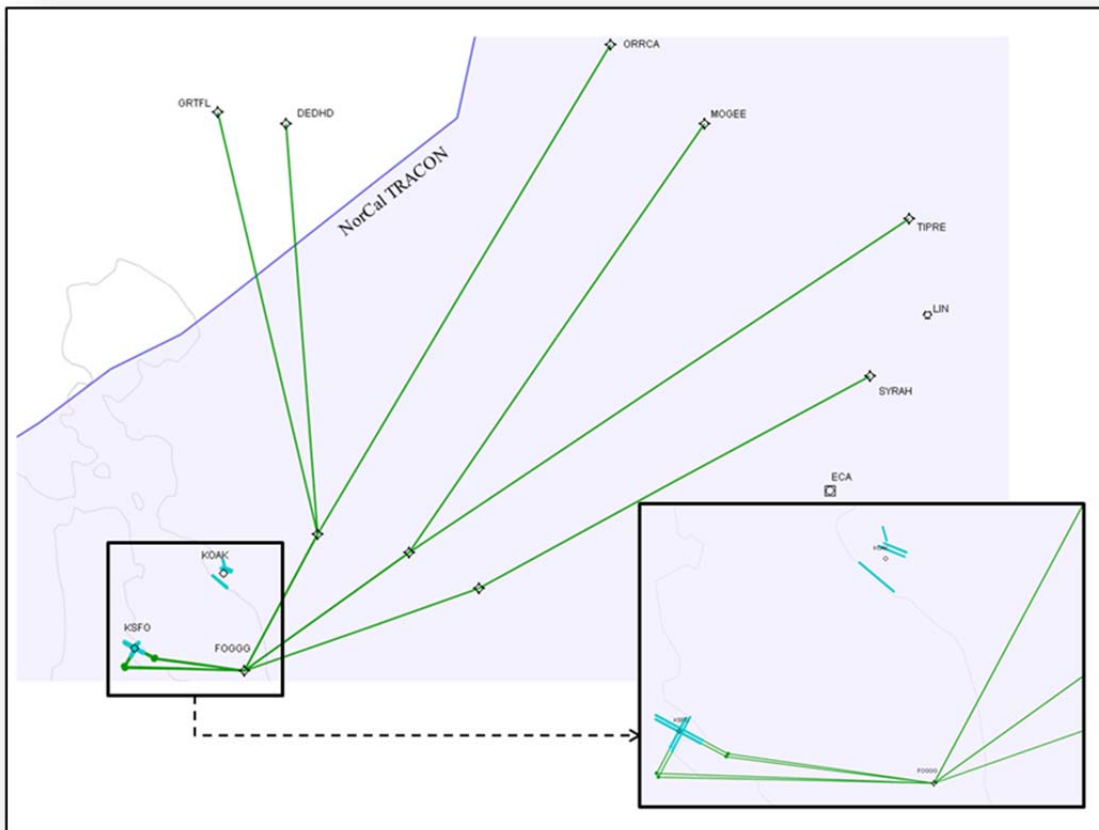


Figure 2: Proposed Procedure

Northern California (NorCal) OAPM Design Package

SFO FOGGG RNAV DP (formerly SFO DUMBARTON SID)

NorCal Design Team Reference: SFO_FOGGG_DP_ver6.3

Additional Design Considerations

Validation of the proposed design has been accomplished through Human-in-the-Loop (HITL) simulations.

The proposed changes do not require a spectrum analysis.

Implementation Dependencies

The SFO FOGGG DP is designed to be compatible with the SFO CIITY, OAK GSTEE and the OAK KATFH procedures. It is not dependent on any other proposed designs and can be submitted separately as soon as practical for action/processing.

This proposed design requires amendments/modifications to:

- ZOA and NCT Standard Operating Procedures (SOP).
- ZOA/NCT and NCT/SFO Letters of Agreement (LOA).
- Automation.
- NCT East Plan Airspace.

No additional staffing, facilities or equipment is anticipated for this proposed design.

Attachments

Terminal Procedures:

- TARGETS Distribution Package.
- Flight Simulator Worksheet.
- RNAV Pro analysis results.
- HITL Documentation.


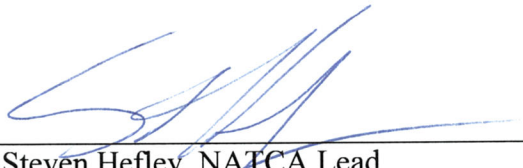




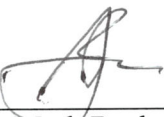
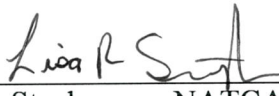
Northern California (NorCal) OAPM Design Package

SFO FOGGG RNAV DP (formerly SFO DUMBARTON SID)

NorCal Design Team Reference: SFO_FOGGG_DP_ver6.3

Review Signatures

The D&I Team reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

 Patricia Daniel, FAA Lead Northern California OAPM	1-24-13 Date	 Steven Hefley, NATCA Lead Northern California OAPM	1/24/13 Date
 John F. Fisher, Facility POC Oakland ARTCC	1/24/13 Date	 Robert Newray, NATCA POC Oakland ARTCC	1/24/13 Date
 Paul Pegadiotes, Facility POC Northern California TRACON	1/24/13 Date	 Richard Hull, NATCA POC Northern California TRACON	1/24/13 Date
 Mark Paulus, Facility Lead San Francisco Tower	1-17-13 Date	 Lisa Stephenson, NATCA Lead San Francisco Tower	1-17-13 Date

Northern California (NorCal) OAPM Design Package

SFO GNNRR RNAV DP (formerly SFO MOLEN SID and SFO GAP SID)

NorCal Design Team Reference: SFO_GNNRR_DP_ver6.3

Name of Change	Date
SFO GNNRR RNAV DP	12/21/2012
Change Classification	Current Phase of Design
Terminal Procedure DP	<input type="checkbox"/> Preliminary Design (PD) <input type="checkbox"/> Operational Design (OD) <input type="checkbox"/> Operational Design Complete (ODC) <input checked="" type="checkbox"/> Proposed Final Design (PFD)
OAPM Study Team Reference(s)	Implementation Date
None	2014
Affected Facilities and Positions, Areas, and/or Sectors	Facility Points of Contact
Oakland ARTCC (ZOA): Sectors: 35 36-Mendocino High 40 41 Northern California TRACON (NCT): Sectors: SUTRO San Francisco Tower (SFO)	ZOA: James Meadows 510-745-3469 Robert Newray 510-918-6859 NCT: Paul Pegadiotes 916-366-4048 Richard Hull 916-201-3206 SFO: Mark Paulus 650-876-2883 X108 David Caldwell 209-602-1834
Related/Dependent Submissions	Associated Data Files
NCT West Plan Airspace Change	Master Targets File

Purpose

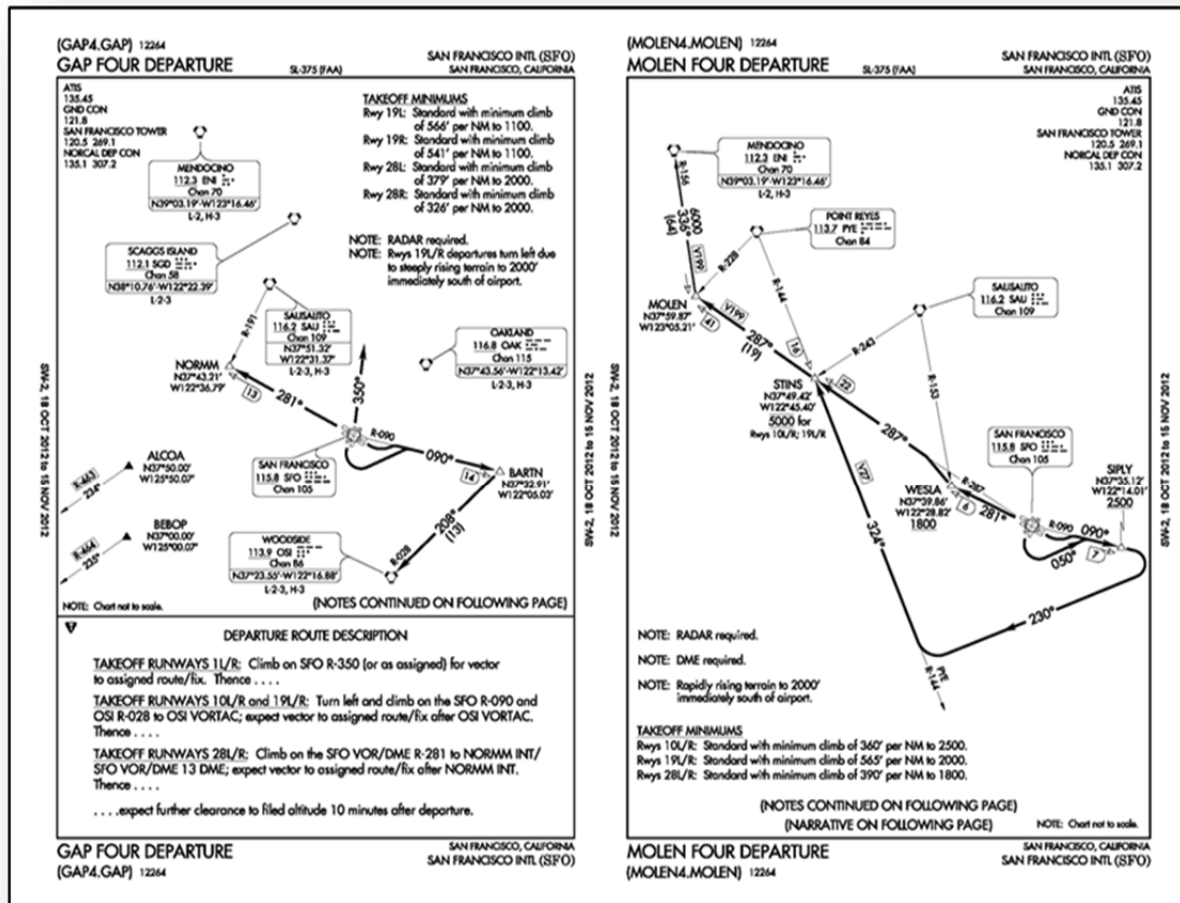
The purpose of the proposed procedure is to enhance the current conventional SFO MOLEN and SFO GAP SIDs (Figure 1) and address the following items identified by the NorCal OAPM Design Team for SFO departures:

- Flight Tracks do not follow published route.
- Lack of repeatable predictable flight paths.
- Efficient Cost to Carry (CTC) fuel planning.
- Optimization of lateral/vertical flight paths.
- Use of Performance Based Navigation (PBN).

Northern California (NorCal) OAPM Design Package

SFO GNNRR RNAV DP (formerly SFO MOLEN SID and SFO GAP SID)

NorCal Design Team Reference: SFO_GNNRR_DP_ver6.3



Study Team Recommendation

The NorCal Study Team did not provide recommendation on this particular procedure, however after further analysis the NorCal Design Team proposed a new procedure to optimize and add efficiency to current operations.

Northern California (NorCal) OAPM Design Package

SFO GNNRR RNAV DP (formerly SFO MOLEN SID and SFO GAP SID)

NorCal Design Team Reference: SFO_GNNRR_DP_ver6.3

Proposed Final Design

The NorCal Design Team is proposing the creation of the new RNAV SFO GNNRR procedure (Figure 2) for SFO Runway 28 Oceanic departures. The current conventional SFO GAP and SFO MOLEN published SIDs will continue to be used by aircraft unable to utilize Performance Based Navigation (PBN) procedures.

The design elements and benefits include:

- Use of Performance Based Navigation (PBN).
- Optimization of lateral flight paths.
- Elimination of ground based Navaid dependency.
- Predictable and repeatable flight tracks.
- Reduction in controller workload and controller/pilot transmissions.
- Efficient Cost to Carry (CTC) fuel planning.
- Departure routes expanded from three to five.

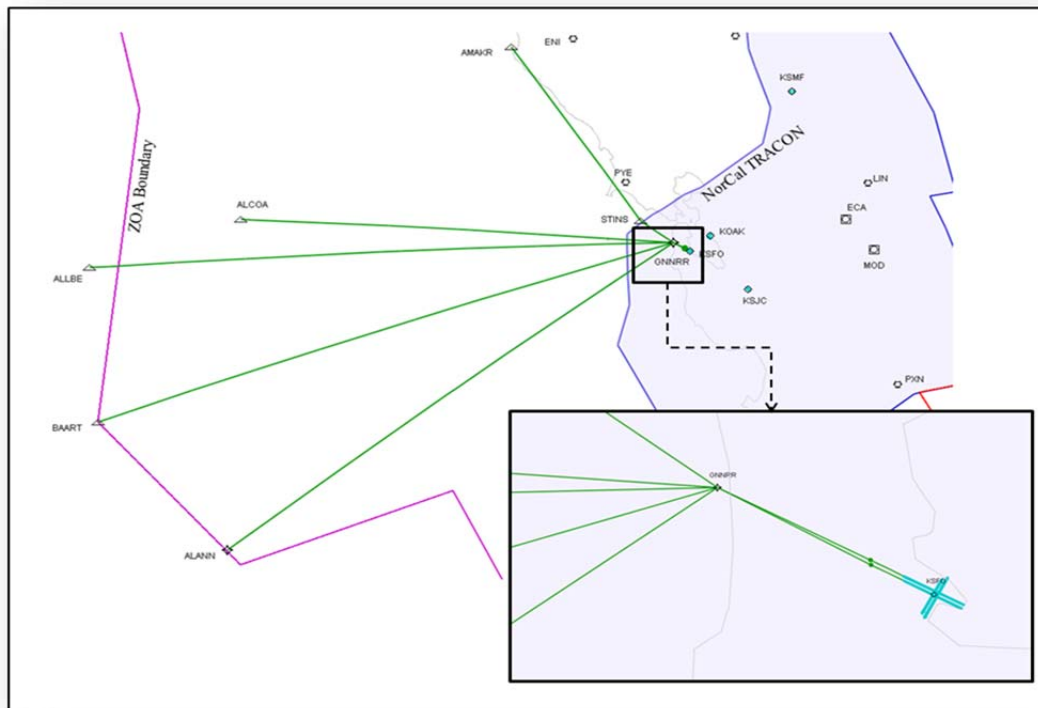


Figure 2: Proposed Procedure

Northern California (NorCal) OAPM Design Package

SFO GNNRR RNAV DP (formerly SFO MOLEN SID and SFO GAP SID)

NorCal Design Team Reference: SFO_GNNRR_DP_ver6.3

Additional Design Considerations

Validation of the proposed design has been accomplished through Human-in-the-Loop (HITL) simulations.

The proposed changes do not require a spectrum analysis.

Implementation Dependencies

The SFO GNNRR RNAV DP is not dependent on any other proposed designs and can be submitted separately as soon as practical for action/processing.

This proposed design requires amendments/modifications to:

- ZOA, NCT and SFO Standard Operating Procedures (SOP).
- ZOA/NCT and NCT/SFO Letters of Agreement (LOA).
- Automation.
- NCT West Plan Airspace.

No additional staffing, facilities or equipment is anticipated for this proposed design.

Attachments

Terminal Procedures:

- TARGETS Distribution Package.
- Flight Simulator Worksheet.
- RNAV Pro analysis results.
- HITL Documentation.


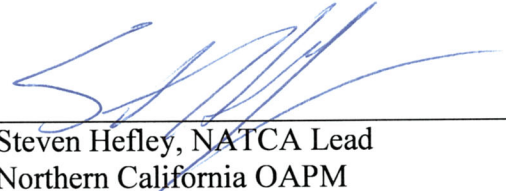

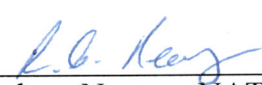
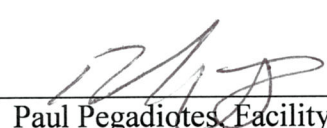


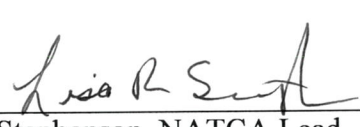
Northern California (NorCal) OAPM Design Package

SFO GNNRR RNAV DP (formerly SFO MOLEN SID and SFO GAP SID)

NorCal Design Team Reference: SFO_GNNRR_DP_ver6.3

Review Signatures

The D&I Team reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

 Patricia Daniel, FAA Lead Northern California OAPM	<u>1-24-13</u> Date	 Steven Hefley, NATCA Lead Northern California OAPM	<u>1/24/13</u> Date
 John F. Fisher, Facility POC Oakland ARTCC	<u>1/24/13</u> Date	 Robert Newray, NATCA POC Oakland ARTCC	<u>1/24/13</u> Date
 Paul Pegadiotes, Facility POC Northern California TRACON	<u>1/24/13</u> Date	 Richard Hull, NATCA POC Northern California TRACON	<u>1/24/13</u> Date
 Mark Paulus, Facility Lead San Francisco Tower	<u>1/17/13</u> Date	 Lisa Stephenson, NATCA Lead San Francisco Tower	<u>1-17-13</u> Date

Northern California (NorCal) OAPM Design Package

SFO NIITE RNAV DP (formerly SFO QUIET SID)

NorCal Design Team Reference: SFO_NIITE_DP_ver6.3

Name of Change	Date
SFO NIITE RNAV DP	12/21/2012
Change Classification	Current Phase of Design
Terminal Procedure DP	<input type="checkbox"/> Preliminary Design (PD) <input type="checkbox"/> Operational Design (OD) <input type="checkbox"/> Operational Design Complete (ODC) <input checked="" type="checkbox"/> Proposed Final Design (PFD)
OAPM Study Team Reference(s)	Implementation Date
4.9.4	2014
Affected Facilities and Positions, Areas, and/or Sectors	Facility Points of Contact
Oakland ARTCC (ZOA): Sectors: 29-Linden High 31-Red Bluff 35 41 Northern California TRACON (NCT): Sectors: Richmond Sutro Fairfield San Francisco Tower (SFO)	ZOA: James Meadows 510-745-3469 Robert Newray 510-918-6859 NCT: Paul Pegadiotes 916-366-4048 Richard Hull 916-201-3206 SFO: Mark Paulus 650-876-2883 X108 David Caldwell 209-602-1834
Related/Dependent Submissions	Associated Data Files
NCT East and West Plan Airspace Change	Master Targets File

Purpose

The purpose of the proposed procedure is to enhance the current conventional SFO QUIET SID (Figure 1) and address the following items identified by the NorCal OAPM Study and Design Teams for SFO departures:

- Flight Tracks do not follow published route.
- Lack of repeatable predictable flight paths.
- Efficient Cost to Carry (CTC) fuel planning.
- Optimization of lateral/vertical flight paths.
- Use of Performance Based Navigation (PBN).

Northern California (NorCal) OAPM Design Package

SFO NIITE RNAV DP (formerly SFO QUIET SID)

NorCal Design Team Reference: SFO_NIITE_DP_ver6.3

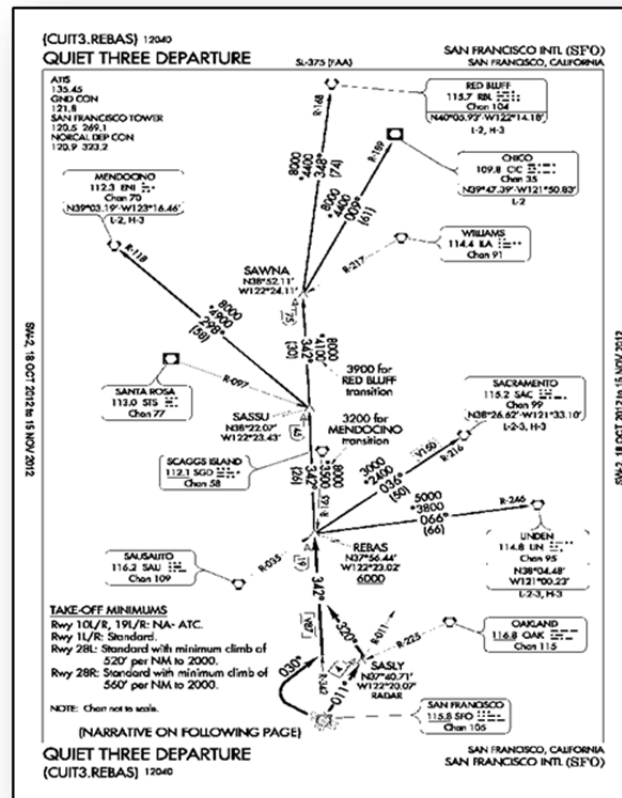


Figure 1: Current Procedure

Study Team Recommendation

The Study Team examined numerous alternatives to de-conflict the OAK SLNT SID from the SFO QUIET SID to provide a new optimized design. The Study Team made the following recommendations:

- Create an RNAV procedure with vertical profiles.
- Design an RNAV procedure that will allow for repeatable, predictable paths.

Northern California (NorCal) OAPM Design Package

SFO NIITE RNAV DP (formerly SFO QUIET SID)

NorCal Design Team Reference: SFO_NIITE_DP_ver6.3

Proposed Final Design

The NorCal Design Team is proposing the creation of the new SFO NIITE RNAV procedure (Figure 2) for SFO Runways 01, 28 and 10 departures. The current conventional SFO QUIET procedure will continue to be used by aircraft unable to utilize Performance Based Navigation (PBN) procedures. The proposed procedure will be used between the hours of 2300-0700 local time. The design elements and benefits include:

- Use of Performance Based Navigation (PBN).
- Optimization of lateral flight paths.
- Elimination of ground based Navaid dependency.
- Predictable and repeatable flight tracks.
- Reduction in controller workload and controller/pilot transmissions.
- Efficient Cost to Carry (CTC) fuel planning.
- Lateral track routed over water and further away from land mass as compared to the current departure procedure.
- Single procedure Utilizes SFO runway 10, 28 and 01.
- Optimized departure procedure with seven new departure transitions.
- Routes are designed to maximize efficiencies utilizing expanded terminal to en route transitional separation (3 NM increasing to 5 NM).

Northern California (NorCal) OAPM Design Package

SFO NIITE RNAV DP (formerly SFO QUIET SID)

NorCal Design Team Reference: SFO_NIITE_DP_ver6.3

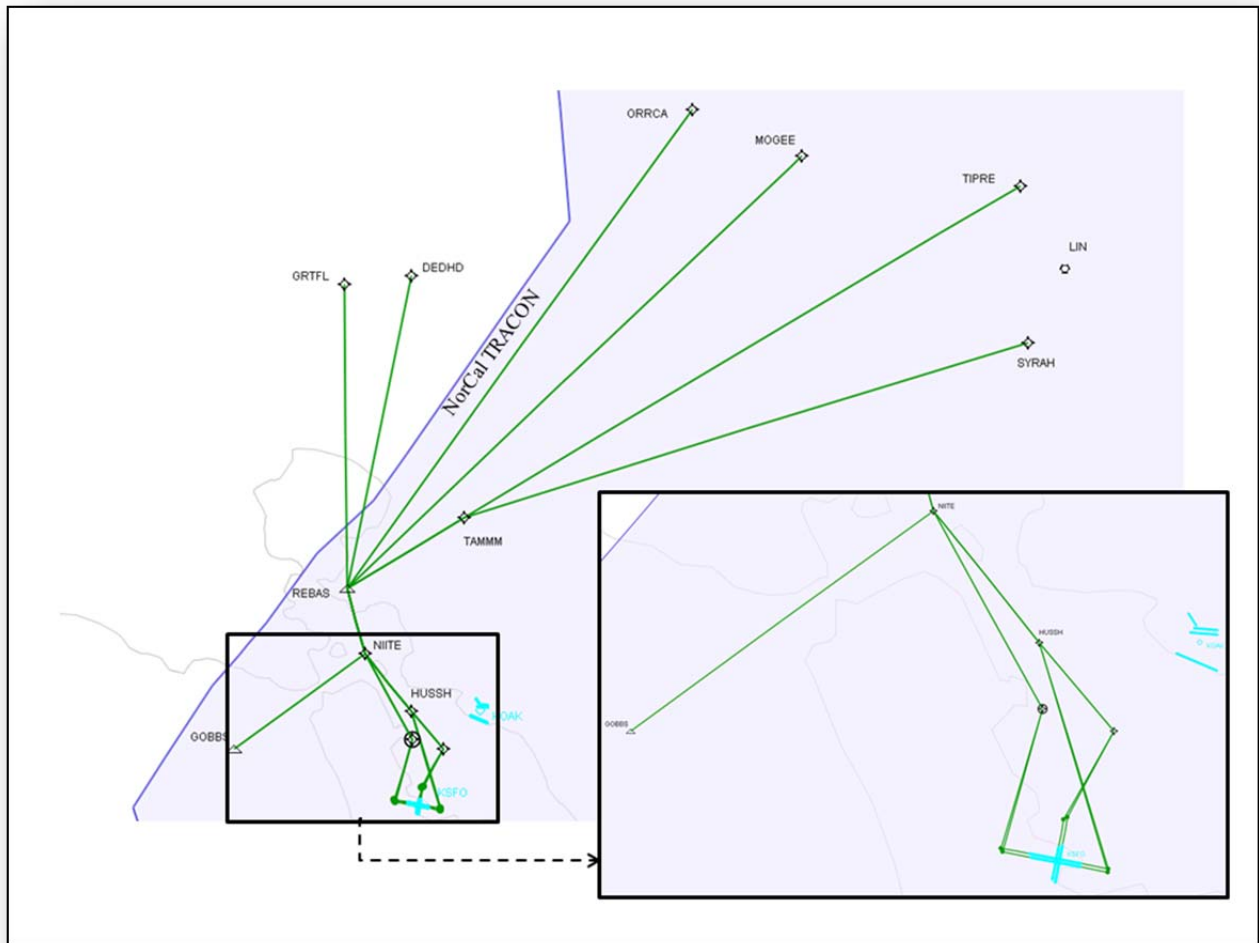


Figure 2: Proposed Procedure

Additional Design Considerations

The proposed changes do not require a spectrum analysis.

Implementation Dependencies

The SFO NIITE RNAV DP is not dependent on any other proposed designs and can be submitted separately and as soon as practical for action/processing.

This proposed design requires amendments/modifications to:

- NCT and SFO Standard Operating Procedures (SOP).

Northern California (NorCal) OAPM Design Package

SFO NIITE RNAV DP (formerly SFO QUIET SID)

NorCal Design Team Reference: SFO_NIITE_DP_ver6.3

- ZOA/NCT and NCT/SFO Letters of Agreement (LOA).
- Automation.
- NCT East and West Plan Airspace.

No additional staffing, facilities or equipment is anticipated for this proposed design.

Attachments

Terminal Procedures:

- TARGETS Distribution Package.
- Flight Simulator Worksheet.
- RNAV Pro analysis results.

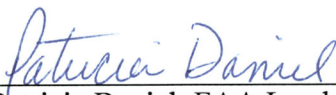

Northern California (NorCal) OAPM Design Package


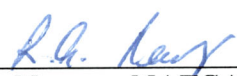
SFO NIITE RNAV DP (formerly SFO QUIET SID)

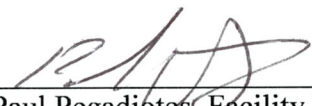

NorCal Design Team Reference: SFO_NIITE_DP_ver6.3


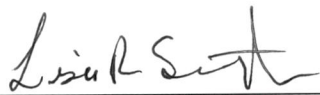
Review Signatures

The D&I Team reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

	1-24-13		1/24/13
Patricia Daniel, FAA Lead Northern California OAPM	Date	Steven Hefley, NATCA Lead Northern California OAPM	Date

	1/24/13		1/24/13
John F. Fisher, Facility POC Oakland ARTCC	Date	Robert Newray, NATCA POC Oakland ARTCC	Date

	1/24/13		1/24/13
Paul Pegadiotes, Facility POC Northern California TRACON	Date	Richard Hull, NATCA POC Northern California TRACON	Date

	1-17-13		1-17-13
Mark Paulus, Facility Lead San Francisco Tower	Date	Lisa Stephenson, NATCA Lead San Francisco Tower	Date

Northern California (NorCal) OAPM Design Package

SFO SAHEY RNAV DP (formerly SFO PORTE SID)

NorCal Design Team Reference: SFO_SAHEY_DP_ver6.3

Name of Change	Date
SFO SAHEY RNAV DP	12/21/2012
Change Classification	Current Phase of Design
Terminal Departure Procedure (DP)	<input type="checkbox"/> Preliminary Design (PD) <input type="checkbox"/> Operational Design (OD) <input type="checkbox"/> Operational Design Complete (ODC) <input checked="" type="checkbox"/> Proposed Final Design (PFD)
OAPM Study Team Reference(s)	Implementation Date
None	2014
Affected Facilities and Positions, Areas, and/or Sectors	Facility Points of Contact
Oakland ARTCC (ZOA): Sectors: 10 11 13-Panoche High 14-Big Sur High 15-Clovis High Northern California TRACON (NCT): Sectors: Sutro Richmond Toga San Francisco Tower (SFO)	ZOA: James Meadows 510-745-3469 Robert Newray 510-918-6859 NCT: Paul Pegadiotes 916-366-4048 Richard Hull 916-201-3206 SFO: Mark Paulus 650-876-2883 X108 David Caldwell 209-602-1834
Related/Dependent Submissions	Associated Data Files
NCT East Plan Airspace Change	Master Targets File

Purpose

The purpose of the proposed procedure is to enhance the current conventional SFO PORTE SID (Figure 1) and address the following items identified by the NorCal OAPM Design Team for SFO departures:

- Flight Tracks do not follow published route.
- Lack of repeatable predictable flight paths.
- Efficient Cost to Carry (CTC) fuel planning.
- Optimization of lateral/vertical flight paths.

Northern California (NorCal) OAPM Design Package

SFO SAHEY RNAV DP (formerly SFO PORTE SID)

NorCal Design Team Reference: SFO_SAHEY_DP_ver6.3

- Use of Performance Based Navigation (PBN).

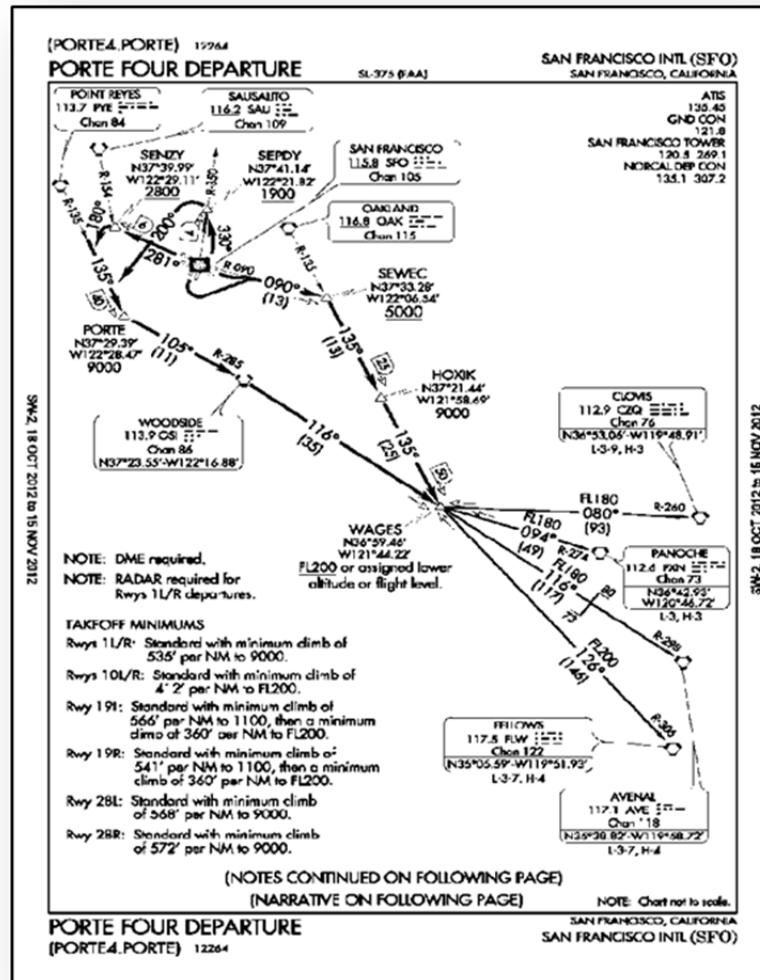


Figure 1: Current Procedure

Study Team Recommendation

The NorCal Study Team did not provide recommendation on this particular procedure, however after further analysis the NorCal Design Team proposed a new procedure to optimize and add efficiency to current operations.

Northern California (NorCal) OAPM Design Package

SFO SAHEY RNAV DP (formerly SFO PORTE SID)

NorCal Design Team Reference: SFO_SAHEY_DP_ver6.3

Proposed Final Design

The NorCal Design Team is proposing the creation of the new SFO SAHEY RNAV DP (Figure 2) for SFO Runway 10 and Runway 19 departures. The current conventional SFO PORTE SID will continue to be used by aircraft unable to utilize Performance Based Navigation (PBN) procedures. The design elements and benefits include:

- Use of Performance Based Navigation (PBN).
- Optimization of lateral flight paths.
- Elimination of ground based Navaid dependency.
- Predictable and repeatable flight tracks.
- Reduction in controller workload and controller/pilot transmissions.
- Efficient Cost to Carry (CTC) fuel planning.
- En route transitions were optimized and increased from four to five.
- Allows for simultaneous runway 10 departures with the SFO FOGGG RNAV DP.
- Routes are designed to maximize efficiencies utilizing expanded terminal to en route transitional separation (3 NM increasing to 5 NM).

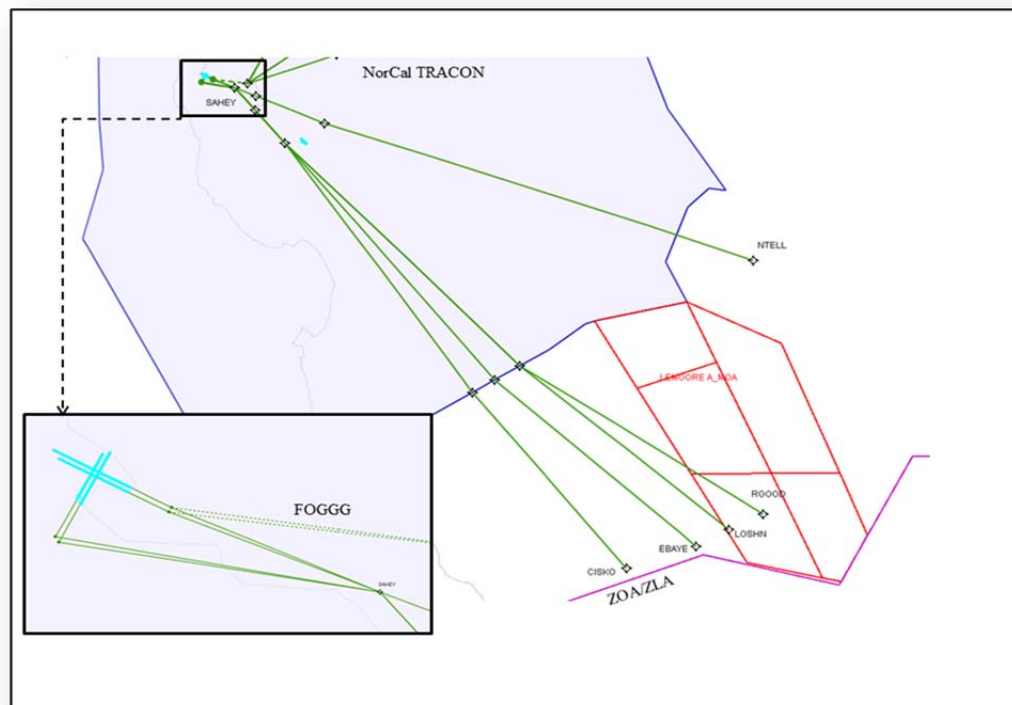


Figure 2: Proposed Procedure

Northern California (NorCal) OAPM Design Package

SFO SAHEY RNAV DP (formerly SFO PORTE SID)

NorCal Design Team Reference: SFO_SAHEY_DP_ver6.3

Additional Design Considerations

Validation of the proposed design has been accomplished through Human-in-the-Loop (HITL) simulations.

The proposed changes do not require a spectrum analysis.

Implementation Dependencies

The SFO SAHEY DP was designed to be compatible with the SFO FOGGG and the OAK GSTEE RNAV DPs. It is not dependent on any other proposed designs and can be submitted separately from all other NorCal proposed designs as soon as practical for action/processing.

This proposed design requires amendments/modifications to:

- ZOA, SFO and NCT Standard Operating Procedures (SOP).
- ZOA, SFO and NCT Letters of Agreement (LOA).
- Automation.
- NCT East Plan Airspace.

No additional staffing, facilities or equipment is anticipated for this proposed design.

Attachments

Terminal Procedures:

- TARGETS Distribution Package.
- Flight Simulator Worksheet.
- RNAV Pro analysis results.
- HITL simulation results.

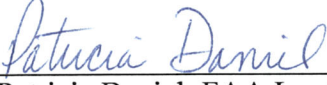

Northern California (NorCal) OAPM Design Package

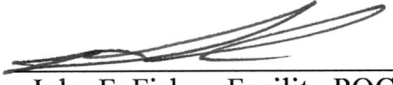
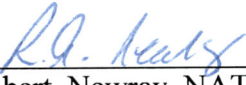
SFO SAHEY RNAV DP (formerly SFO PORTE SID)

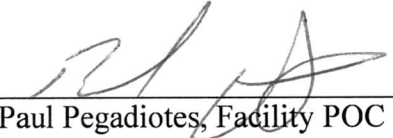

NorCal Design Team Reference: SFO_SAHEY_DP_ver6.3


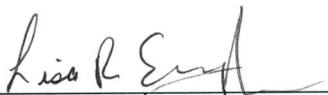
Review Signatures

The D&I Team reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

	
Patricia Daniel, FAA Lead Northern California OAPM	Steven Hefley, NATCA Lead Northern California OAPM
1-24-13	1/24/13
Date	Date

	
John F. Fisher, Facility POC Oakland ARTCC	Robert Newray, NATCA POC Oakland ARTCC
1/24/13	1/24/13
Date	Date

	
Paul Pegadiotes, Facility POC Northern California TRACON	Richard Hull, NATCA POC Northern California TRACON
1/24/13	1/24/13
Date	Date

	
Mark Paulus, San Francisco Tower Facility Lead	Lisa Stephenson, San Francisco Tower NATCA Lead
1-17-13	1-17-13
Date	Date

Northern California (NorCal) OAPM Design Package

SFO SERFR STAR (SFO BIG SUR STAR and SFO HADLY STAR)

NorCal SFO_SERFR_STAR_Ver 6.3 SFO_SERFR_STAR_ver6.3

Name of Change	Date
SFO SERFR STAR	12/21/2012
Change Classification	Current Phase of Design
Terminal Procedure STAR	<input type="checkbox"/> Preliminary Design (PD) <input type="checkbox"/> Operational Design (OD) <input type="checkbox"/> Operational Design Complete (ODC) <input checked="" type="checkbox"/> Proposed Final Design (PFD)
OAPM Study Team Reference(s)	Implementation Date
4.5.2.3	2014
Affected Facilities and Positions, Areas, and/or Sectors	Facility Points of Contact
Oakland ARTCC (ZOA): Sectors: 14 35 Northern California TRACON (NCT): Sectors: Area A - Seca, Fremont, Hooks, Morgan Area B - Laguna, Boulder	ZOA: James Meadows 510-745-3469 Robert Newray 510-918-6859 NCT: Paul Pegadiotes 916-366-4048 Richard Hull 916-201-3206
Related/Dependent Submissions	Associated Data Files
NCT West and East Plan Airspace Change	Master Targets File

Purpose

The purpose of the proposed procedure is to enhance the current conventional SFO BIG SUR and SFO HADLY STARs (Figure 1) and address the following items identified by the NorCal OAPM Study and Design Teams:

- Flight Tracks do not follow published route.
- Lack of repeatable predictable flight paths.
- Optimization of lateral/vertical flight paths.
- Procedurally de-conflict from other area STARs.
- Efficient Cost to Carry (CTC) fuel planning.
- Use of Performance Based Navigation (PBN).

Northern California (NorCal) OAPM Design Package

SFO SERFR STAR (SFO BIG SUR STAR and SFO HADLY STAR)

NorCal SFO_SERFR_STAR_Ver 6.3 SFO_SERFR_STAR_ver6.3

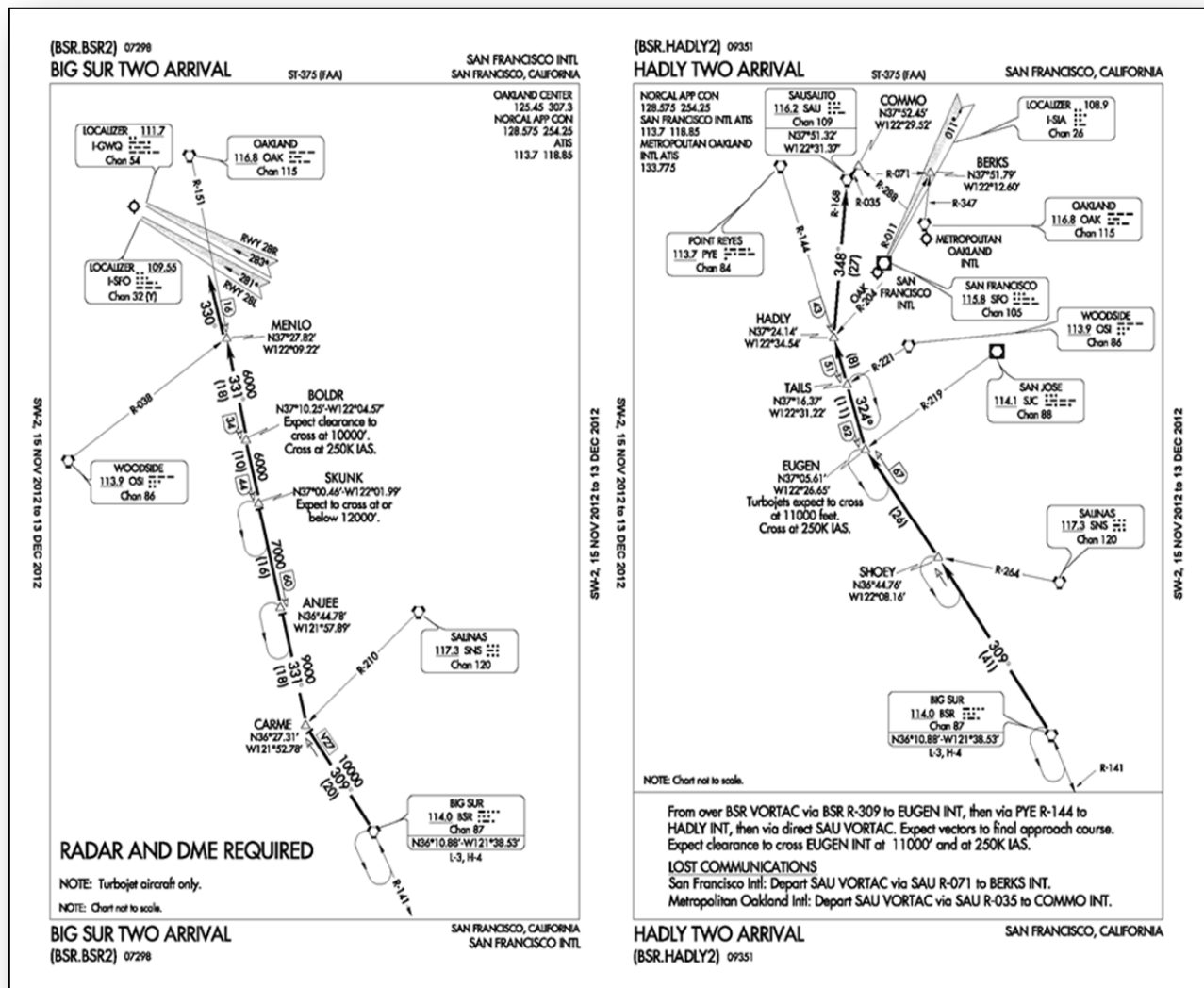


Figure 1: Current Procedures

Study Team Recommendation

The NorCal OAPM Study Team made the following recommendations for improved design of SFO STARs:

- RNAV STARs be designed with OPD benefits.

Northern California (NorCal) OAPM Design Package

SFO SERFR STAR (SFO BIG SUR STAR and SFO HADLY STAR)

NorCal SFO_SERFR_STAR_Ver 6.3 SFO_SERFR_STAR_ver6.3

- Have predictable repeatable paths.
- Align with current flight paths by creating en route transitions to ANJEE.
- Establish a transition from the ZOA/ZLA boundary (MAKRS).
- Create conditional use airspace for holding at the NCT/ZOA boundary.

Figure 2 illustrates the current published procedure (solid red) and the Study Team recommended routes (dashed blue), as well as current tracks (green).

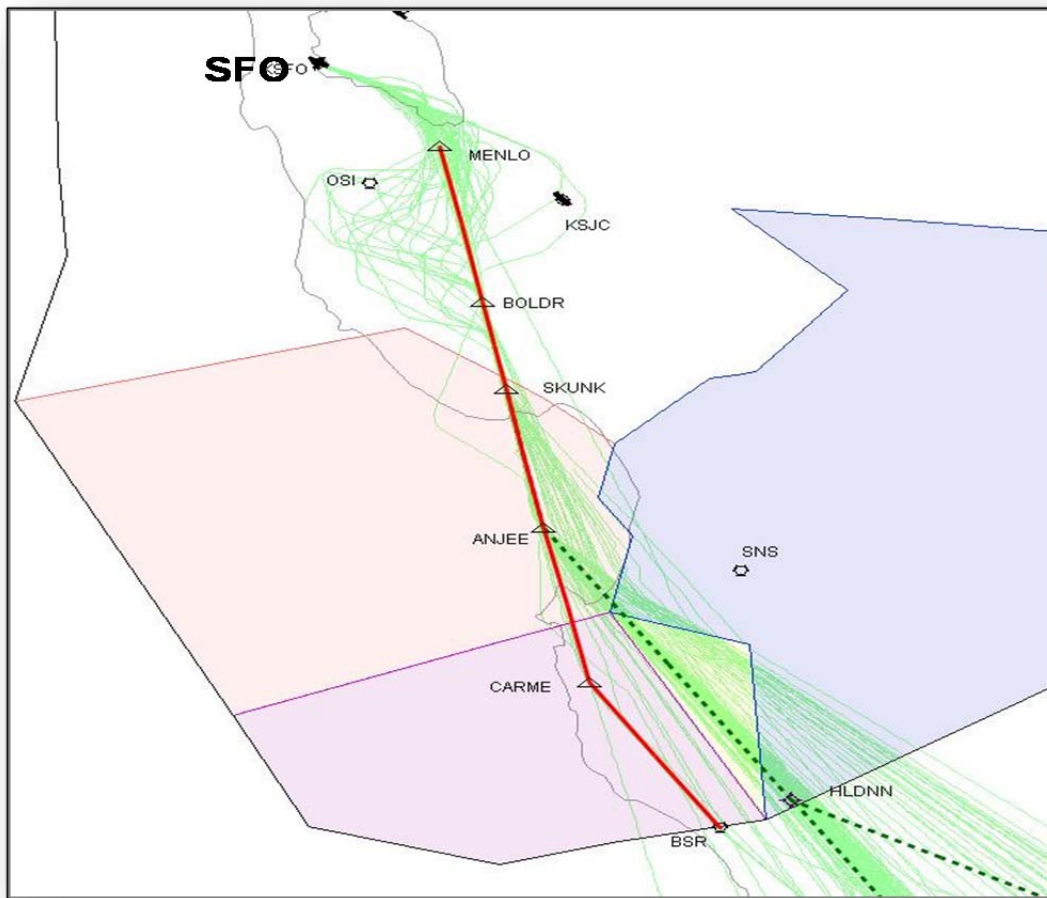


Figure 2: Study Team Recommendation

Northern California (NorCal) OAPM Design Package

SFO SERFR STAR (SFO BIG SUR STAR and SFO HADLY STAR)

NorCal SFO_SERFR_STAR_Ver 6.3 SFO_SERFR_STAR_ver6.3

Proposed Final Design

The NorCal Design Team is proposing a new RNAV procedure to be named the SFO SERFR STAR (Figure 3). It is designed as an Optimized Profile Descent (OPD) STAR. The current conventional SFO BIG SUR and SFO HADLY STARs will continue to be used by aircraft unable to utilize Performance Based Navigation (PBN) procedures. The new design elements and benefits include:

- Use of Performance Based Navigation (PBN).
- Optimization of lateral/vertical flight paths.
- Elimination of ground based Navaid dependency.
- Predictable and repeatable flight tracks.
- Reduction in controller workload and controller/pilot transmissions.
- Efficient Cost to Carry (CTC) fuel planning.
- Incorporated the current HADLY STAR into the design, creating a new transition for Runway 19 configuration which differs from the NorCal Study Team proposal.

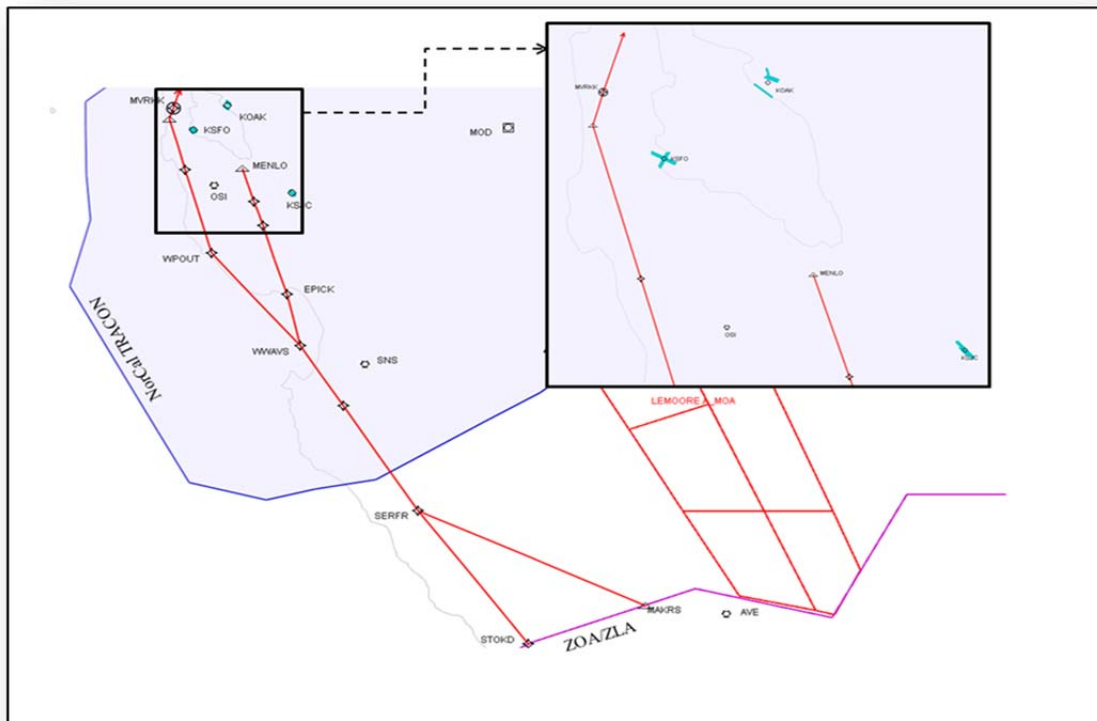


Figure 3: Proposed Procedure

Northern California (NorCal) OAPM Design Package

SFO SERFR STAR (SFO BIG SUR STAR and SFO HADLY STAR)

NorCal SFO_SERFR_STAR_Ver 6.3 SFO_SERFR_STAR_ver6.3

Additional Design Considerations

Validation of the proposed design has been accomplished through Human-in-the-Loop (HITL) simulations.

The proposed changes do not require a spectrum analysis.

Implementation Dependencies

The SERFR STAR is not dependent on any other proposed designs and can be submitted separately as soon as practical for action/processing.

This proposed design requires amendments/modifications to:

- ZOA and NCT Standard Operating Procedures (SOP).
- ZOA/ZLA and ZOA/NCT Letters of Agreement (LOA).
- NCT West and East Plan Airspace.

No additional staffing, facilities or equipment is anticipated for this proposed design.

Attachments


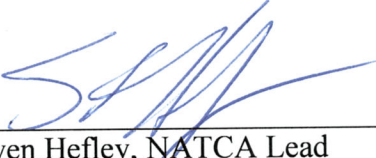
Terminal Procedures:



- TARGETS Distribution Package.
- Flight Simulator Worksheet.
- RNAV Pro analysis results.
- HITL Documentation.



Northern California (NorCal) OAPM Design Package
SFO SERFR STAR (SFO BIG SUR STAR and SFO HADLY STAR)
NorCal SFO SERFR STAR Ver 6.3.docx SFO_SERFR_STAR_ver6.3

Review Signatures

The D&I Team reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

	1-24-13		1/24/13
Patricia Daniel, FAA Lead Northern California OAPM	Date	Steven Hefley, NATCA Lead Northern California OAPM	Date

	1/24/13		1/24/13
John F. Fisher, Facility POC Oakland ARTCC	Date	Robert Newray, NATCA POC Oakland ARTCC	Date

	1/24/13		1/24/13
Paul Pegadiotes, Facility POC Northern California TRACON	Date	Richard Hull, NATCA POC Northern California TRACON	Date

Northern California (NorCal) OAPM Design Package

SFO SNTNA RNAV DP (formerly SFO SAN FRANCISCO SID)

NorCal Design Team Reference: SFO_SNTNA_DP_ver6.3

Name of Change	Date
SFO SNTNA RNAV DP	12/21/2012
Change Classification	Current Phase of Design
Terminal Procedure DP	<input type="checkbox"/> Preliminary Design (PD) <input type="checkbox"/> Operational Design (OD) <input type="checkbox"/> Operational Design Complete (ODC) <input checked="" type="checkbox"/> Proposed Final Design (PFD)
OAPM Study Team Reference(s)	Implementation Date
4.1.2.2 / 4.1.2.3	2014
Affected Facilities and Positions, Areas, and/or Sectors	Facility Points of Contact
Oakland ARTCC (ZOA): Sectors: 29-Linden High 31-Red Bluff High 36-Mendocino High 41 42 Northern California TRACON (NCT): Sectors: Fairfield Kirkwood Paradise Quake Richmond Diablo Sutro San Francisco Tower (SFO)	ZOA: James Meadows 510-745-3469 Robert Newray 510-918-6859 NCT: Paul Pegadiotes 916-366-4048 Richard Hull 916-201-3206 SFO: Mark Paulus 650-876-2883 X108 David Caldwell 209-602-1834
Related/Dependent Submissions	Associated Data Files
Amended entry points: Q route 128/130 NCT West Plan Airspace Change	Master Targets File

Purpose

The purpose of the proposed procedure is to enhance the current conventional SFO SAN FRANCISCO SID (Figure 1) and address the following items identified by the NorCal OAPM Study and Design Teams for SFO departures:

NorCal Design Team Reference: SFO_SNTNA_DP_ver6.3

- (SFO9.SFO) 12264**
SAN FRANCISCO NINE DEPARTURE
 SL-375 (FAA)

SAN FRANCISCO INTL (SFO)
 SAN FRANCISCO, CALIFORNIA

ATIS
 135.45
 GND CON
 121.8
SAN FRANCISCO TOWER
 120.5 269.1
NORCAL DEP CON
 120.9 323.2

RED BLUFF
 115.7 RBL ---
 Chan 104
 N40°05.93'-W122°14.18'
 L-2, H-3

TAKEOFF MINIMUMS
 Rwy's 10L, 10R, 19L, 19R: NA - ATC.
 Rwy's 1L, 1R: Standard with minimum climb of 500' per NM to 3000.
 Rwy's 28L, 28R: Standard with a minimum climb of 351' per NM to 2000.

NOTE: RADAR required.
NOTE: Rwy's 1L/1R: DME required.

SACRAMENTO
 115.2 SAC ---
 Chan 99
 N38°26.62'-W121°33.10'
 L-2-3, H-3

SAUSALITO
 116.2 SAU ---
 Chan 109
 N37°51.32'-W122°31.37'
 L-2-3, H-3

CONCORD
 117.0 CCR ---
 Chan 117
 N38°02.70'-W122°02.71'
 L-2-3, H-3

LINDEN
 114.8 UN ---
 Chan 95
 N38°04.48'-W121°00.23'
 L-2-3, H-3

OAKLAND
 116.8 OAK ---
 Chan 115
 N37°43.56'-W122°13.42'
 L-2-3, H-3

MANATECA
 116.9 ECA ---
 Chan 107
 N37°50.02'-W121°10.28'
 L-2-3, H-3

SAN FRANCISCO
 115.8 SFO ---
 Chan 105

NORMM
 N37°43.21'-W122°36.79'

3000

030°

281°

13

19

NOTE: Chart not to scale.
(NOTES CONTINUED ON FOLLOWING PAGE)

DEPARTURE ROUTE DESCRIPTION
TAKEOFF RUNWAYS 1L/R: Climbing right turn heading 030° or ATC assigned heading to cross SFO 6 DME at or above 3000 for RADAR vectors to assigned route/fix. Expect further clearance to filed altitude 10 minutes after departure.
TAKEOFF RUNWAYS 28L/R: Climb on SFO VOR/DME R-281 to NORMM INT/SFO 13 DME; then expect RADAR vectors to assigned route/fix. Expect further clearance to filed altitude 10 minutes after departure.
LOST COMMUNICATIONS:
 If not in contact with departure control after reaching 3000, continue climb to filed altitude and proceed direct to assigned route/fix.

SAN FRANCISCO NINE DEPARTURE
(SFO9.SFO) 12264
 SAN FRANCISCO, CALIFORNIA
 SAN FRANCISCO INTL (SFO)

2

Northern California (NorCal) OAPM Design Package

SFO SNTNA RNAV DP (formerly SFO SAN FRANCISCO SID)

NorCal Design Team Reference: SFO_SNTNA_DP_ver6.3

Study Team Recommendation

The NorCal OAPM Study Team made the following recommendations to address the issues identified for the SFO departure procedure:

- Create a new SFO RNAV SID.
- De-conflicted from other STARs/SIDs.
- Align new RNAV IDP procedures with current traffic flows.
- En Route transitions are increased from three to eight.
- Northeast transitions leverage the new Q-Routes from Sacramento (SAC) VOR, Linden VOR (LIN), MOGEE and TIPRE.
- Create an RNAV SID that provides a predictable, repeatable path.

Figure 2 illustrates the proposed routes (dashed red), as well as current tracks (blue).

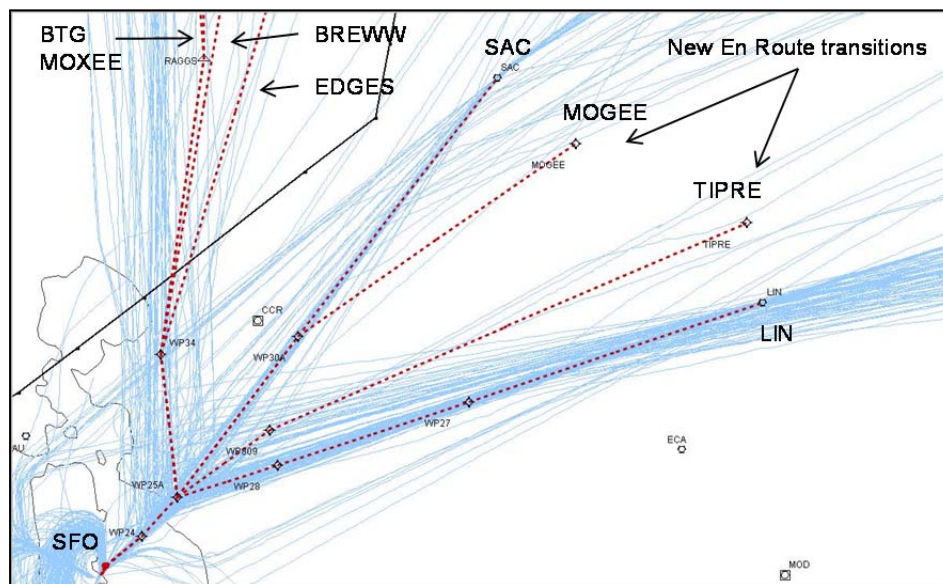


Figure 2: Primary Study Team Recommendation

Northern California (NorCal) OAPM Design Package

SFO SNTNA RNAV DP (formerly SFO SAN FRANCISCO SID)

NorCal Design Team Reference: SFO_SNTNA_DP_ver6.3

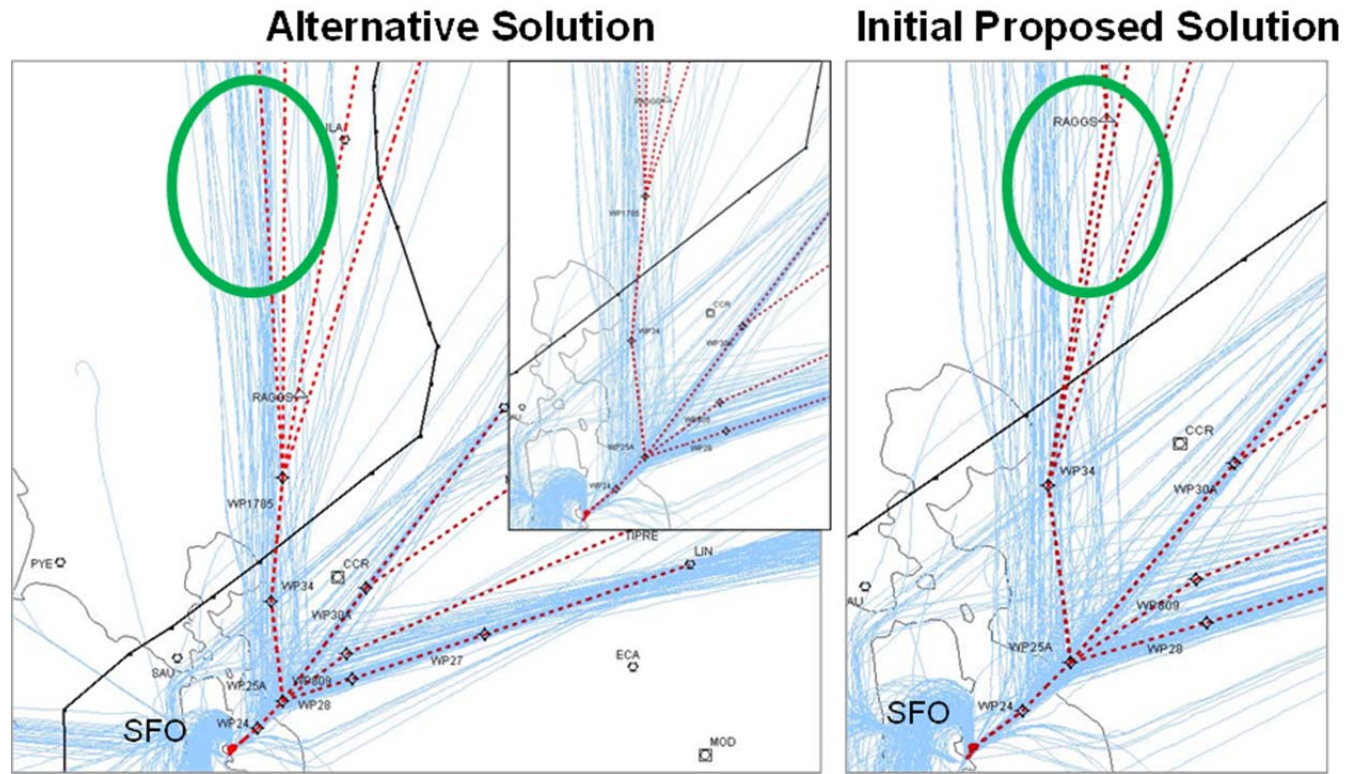


Figure 3: Study Team Recommendation Alternative Proposal

Study Team Alternative proposal is illustrated in Figure 3. This proposal was provided for the north departure procedures and:

- Aligns with current northbound flight tracks.
- Waypoint approximately 12 miles south of RAGGS to be used as an earlier transition point to BTG and MOXEE.
- It incorporates the ZOA requirement of a 350 degree initial heading.
- Adjacent center coordination will be required to accommodate new the departure fixes.

Northern California (NorCal) OAPM Design Package

SFO SNTNA RNAV DP (formerly SFO SAN FRANCISCO SID)

NorCal Design Team Reference: SFO_SNTNA_DP_ver6.3

Proposed Final Design

The NorCal Design Team is proposing the creation of the new SFO SNTNA RNAV DP (Figure 4) for SFO Runway 28 departures to the North and Northeast. The current published Runway 28 SFO SID relies upon initial radar vectors as the primary means of navigation and will continue to be used by aircraft unable to utilize Performance Based Navigation (PBN) procedures. The design elements and benefits include:

- Use of Performance Based Navigation (PBN).
- Optimization of lateral flight paths.
- Elimination of ground based Navaid dependency.
- Predictable and repeatable flight tracks.
- Reduction in controller workload and controller/pilot transmissions.
- Efficient Cost to Carry (CTC) fuel planning.
- Expands the current number of departure routes from three to six.
- Will utilize the same waypoints and merge into the SFO TRUKN procedure.
- Routes are designed to maximize efficiencies utilizing expanded terminal to en route transitional separation (3 NM increasing to 5 NM).

The proposed SFO SNTNA STAR design differences include:

- Uses the new SNTNA fix as a single point for terminal to en route transition, allowing for an earlier divergence and more efficient throughput.
- Six transitions compared to the Study Team recommendation of eight transitions.

Northern California (NorCal) OAPM Design Package

SFO SNTNA RNAV DP (formerly SFO SAN FRANCISCO SID)

NorCal Design Team Reference: SFO_SNTNA_DP_ver6.3

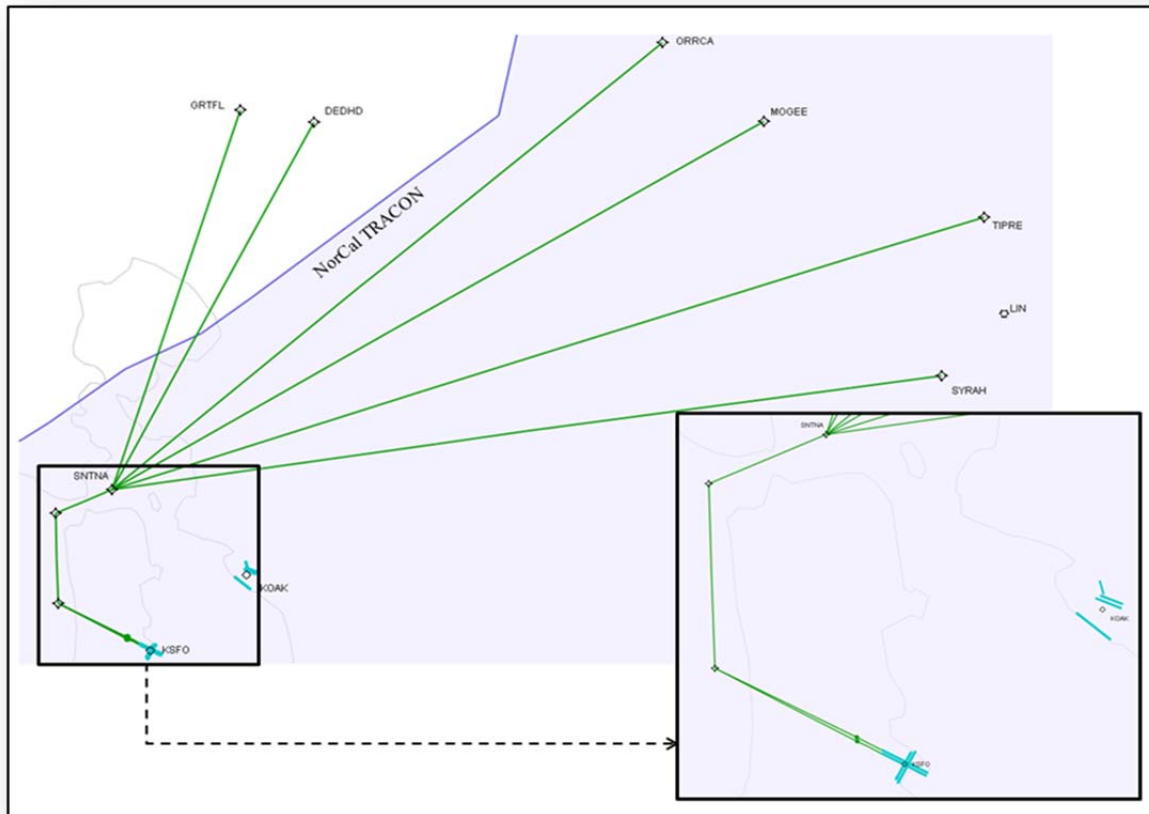


Figure 4: Proposed Procedure

Additional Design Considerations

Validation of the proposed design has been accomplished through Human-in-the-Loop (HITL) simulations.

The proposed changes do not require a spectrum analysis.

Implementation Dependencies

The SFO SNTNA RNAV DP is not dependent on any other proposed designs, and can be submitted separately and as soon as practical for action/processing.

This proposed design requires amendments/modifications to:

- ZOA, NCT and SFO Standard Operating Procedures (SOP).

Northern California (NorCal) OAPM Design Package

SFO SNTNA RNAV DP (formerly SFO SAN FRANCISCO SID)

NorCal Design Team Reference: SFO_SNTNA_DP_ver6.3

- ZOA/NCT and NCT/SFO Letters of Agreement (LOA).
- ARTCC Q Route changes (ZOA to adjust Q Route 128/130) which is currently being processed by ZOA 530.
- Automation.
- NCT West Plan Airspace.

No additional staffing, facilities or equipment is anticipated for this proposed design.

Attachments

Terminal Procedures:

- TARGETS Distribution Package.
- Flight Simulator Worksheet.
- RNAV Pro analysis results.
- HITL Documentation.

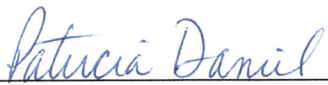
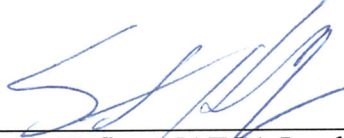
Northern California (NorCal) OAPM Design Package



SFO SNTNA RNAV DP (formerly SFO SAN FRANCISCO SID)

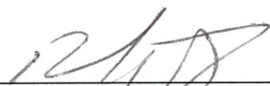

NorCal Design Team Reference: SFO_SNTNA_DP_ver6.3


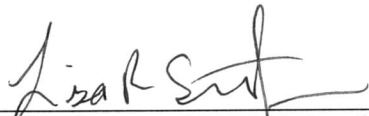
Review Signatures

The D&I Team reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

	1-24-13		1/24/13
Patricia Daniel, FAA Lead Northern California OAPM	Date	Steven Hefley, NATCA Lead Northern California OAPM	Date

	1/24/13		1/24/13
John F. Fisher, Facility POC Oakland ARTCC	Date	Robert Newray, NATCA POC Oakland ARTCC	Date

	1/24/13		1/24/13
Paul Pegadiotes, Facility POC Northern California TRACON	Date	Richard Hull, NATCA POC Northern California TRACON	Date

	1-17-13		1-17-13
Mark Paulus, Facility Lead San Francisco Tower	Date	Lisa Stephenson, NATCA Lead San Francisco Tower	Date

Northern California (NorCal) OAPM Design Package

SFO SSTIK RNAV DP (formerly SFO PORTE SID and SFO OFFSHORE SID)

NorCal Design Team Reference: SFO_SSTIK_DP_ver6.3

Name of Change	Date
SFO SSTIK RNAV DP	12/21/2012
Change Classification	Current Phase of Design
Terminal Departure Procedure (DP)	<input type="checkbox"/> Preliminary Design (PD) <input type="checkbox"/> Operational Design (OD) <input type="checkbox"/> Operational Design Complete (ODC) <input checked="" type="checkbox"/> Proposed Final Design (PFD)
OAPM Study Team Reference(s)	Implementation Date
4.1.2.1	2014
Affected Facilities and Positions, Areas, and/or Sectors	Facility Points of Contact
Oakland ARTCC (ZOA): Sectors: 11 13-Panoche High, 14-Big Sur High 15-Clovis High 22 35 Northern California TRACON (NCT): Sectors: Sutro Quake San Francisco Tower (SFO)	ZOA: James Meadows 510-745-3469 Robert Newray 510-918-6859 NCT: Paul Pegadiotes 916-366-4048 Richard Hull 916-201-3206 SFO: Mark Paulus 650-876-2883 X108 David Caldwell 209-602-1834
Related/Dependent Submissions	Associated Data Files
NCT West Plan Airspace Change	Master Targets File

Purpose

The purpose of the proposed procedure is to enhance the current conventional SFO PORTE and SFO OFFSHORE SIDs (Figure 1) and address the following items identified by the NorCal OAPM Study and Design Teams for SFO departures:

- Flight Tracks do not follow published route.
- Lack of repeatable predictable flight paths.
- Efficient Cost to Carry (CTC) fuel planning.
- Optimization of lateral/vertical flight paths.

Northern California (NorCal) OAPM Design Package

SFO SSTIK RNAV DP (formerly SFO PORTE SID and SFO OFFSHORE SID)

NorCal Design Team Reference: SFO_SSTIK_DP_ver6.3

- Use of Performance Based Navigation (PBN).

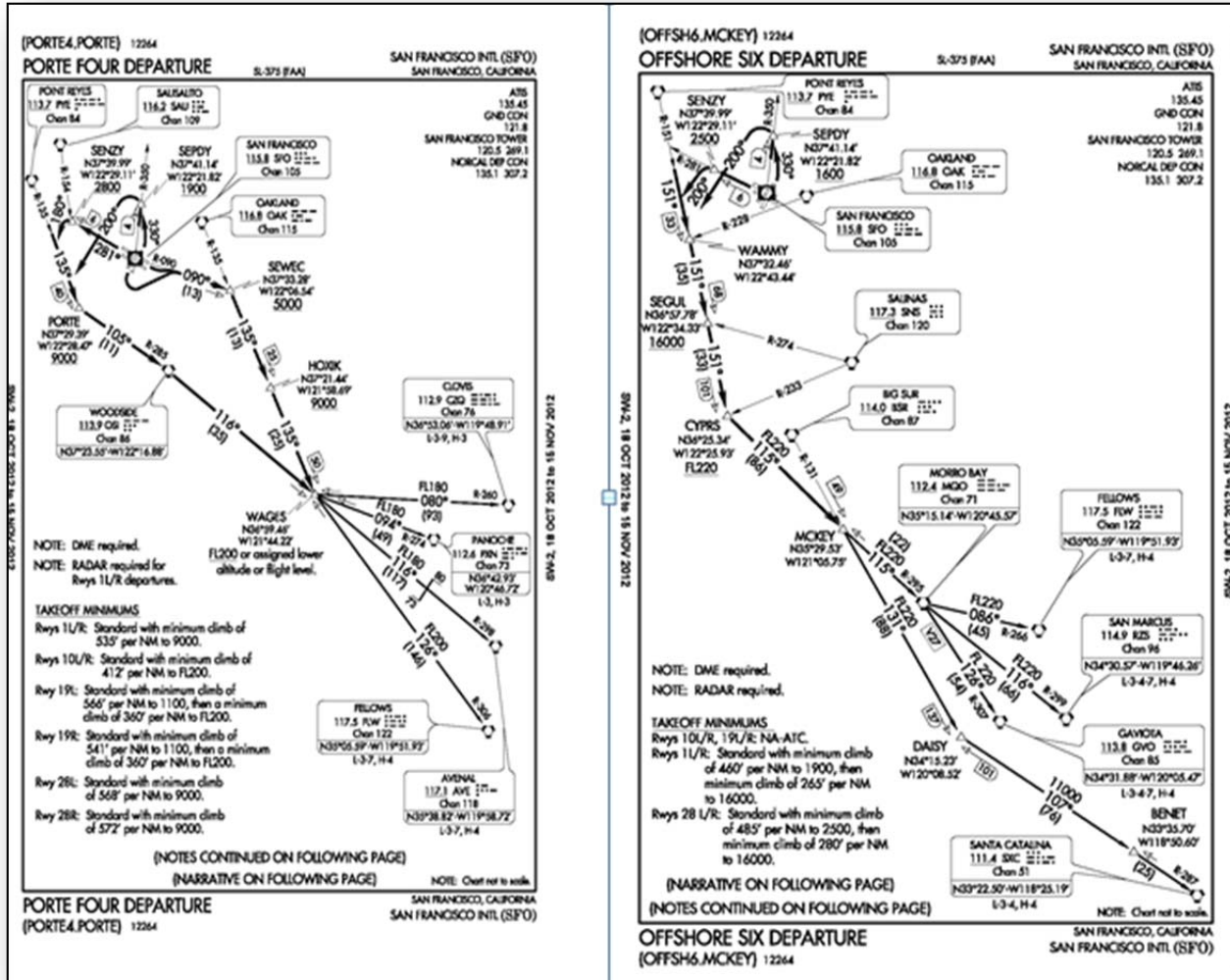


Figure 1: Current Procedures

Study Team Recommendation

The NorCal OAPM Study Team made the following recommendations to address the issues listed above:

- Create a SFO RNAV SID combining the SFO PORTE and SFO OFFSHORE SIDs.
- De-conflicted from other STARs/SIDs.

Northern California (NorCal) OAPM Design Package

SFO SSTIK RNAV DP (formerly SFO PORTE SID and SFO OFFSHORE SID)

NorCal Design Team Reference: SFO_SSTIK_DP_ver6.3

- Align new RNAV IDP procedures with current traffic flows.
- Create an RNAV SID that provides a predictable, repeatable path.
- En route departure transitions increased from 4 to 6.

Figure 2 illustrates the published procedure (solid brown) and the proposed routes (dashed red), as well as the current tracks (blue).

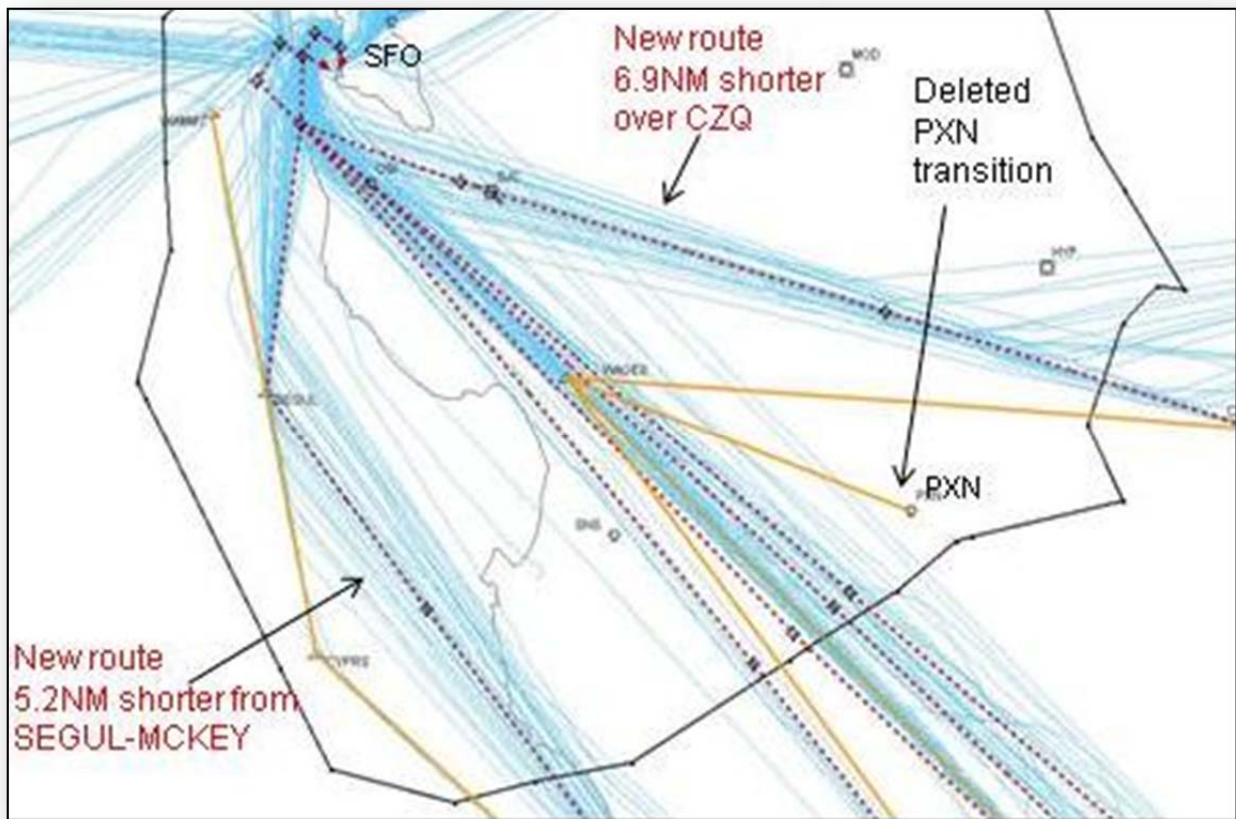


Figure 2: Study Team Recommendation

Proposed Final Design

Northern California (NorCal) OAPM Design Package

SFO SSTIK RNAV DP (formerly SFO PORTE SID and SFO OFFSHORE SID)

NorCal Design Team Reference: SFO_SSTIK_DP_ver6.3

The NorCal Design Team is proposing the creation of the new SFO SSTIK RNAV DP (Figure 3) for SFO Runway 01 South departures. The current conventional SFO PORTE and SFO OFFSHORE SIDs will continue to be used by aircraft unable to utilize Performance Based Navigation (PBN) procedures. The design elements and benefits include:

- Use of Performance Based Navigation (PBN).
- Optimization of lateral flight paths.
- Elimination of ground based Navaid dependency.
- Predictable and repeatable flight tracks.
- Reduction in controller workload and controller/pilot transmissions.
- Efficient Cost to Carry (CTC) fuel planning.
- Combines the SFO PORTE and OFFSHORE SID into a single RNAV DP.
- The lateral track of the SFO SSTIK design is shorter than the current conventional SFO PORTE and SFO OFFSHORE procedures.
- Six optimized transitions improving flow efficiency and flexibility.
- Routes are designed to maximize efficiencies utilizing expanded terminal to en route transitional separation (3 NM increasing to 5 NM).

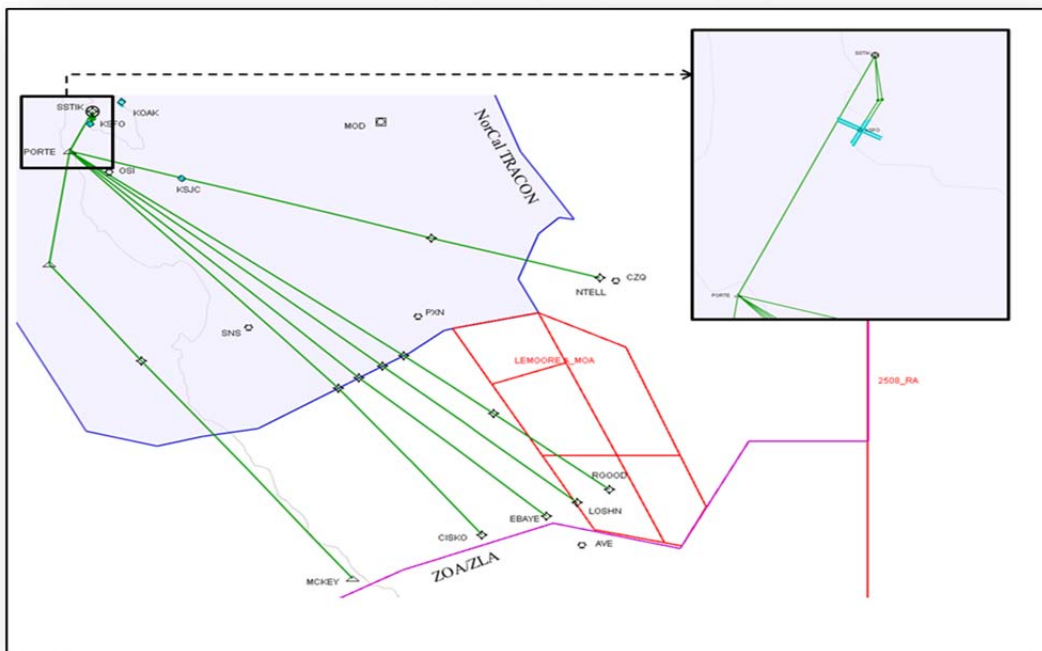


Figure 3: Proposed Procedure

Additional Design Considerations

Northern California (NorCal) OAPM Design Package

SFO SSTIK RNAV DP (formerly SFO PORTE SID and SFO OFFSHORE SID)

NorCal Design Team Reference: SFO_SSTIK_DP_ver6.3

Validation of the proposed design has been accomplished through Human-in-the-Loop (HITL) simulations.

The proposed changes do not require a spectrum analysis.

Implementation Dependencies

The SFO SSTIK RNAV DP is not dependent on any other proposed designs, and can be submitted as soon as practical for action/processing.

This proposed design requires amendments/modifications to:

- ZOA, NCT and SFO Standard Operating Procedures (SOP).
- ZOA/NCT, and NCT/SFO Letters of Agreement (LOA).
- Automation.
- NCT West Plan Airspace.

No additional staffing, facilities or equipment is anticipated for this proposed design.

Attachments

Terminal Procedures:

- TARGETS Distribution Package.
- Flight Simulator Worksheet.
- RNAV Pro analysis results.
- HITL Documentation.

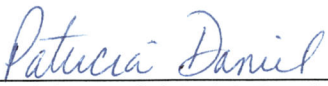
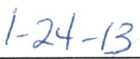
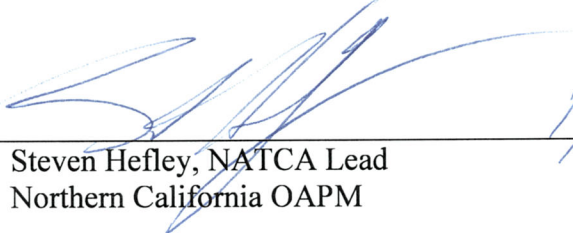
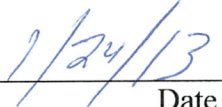
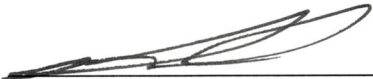
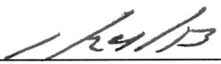
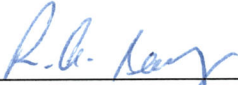
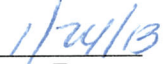

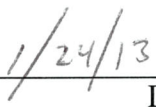

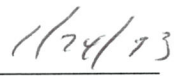

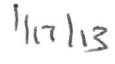
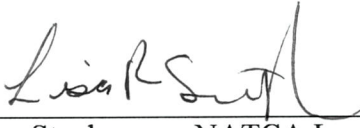
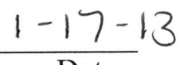
Northern California (NorCal) OAPM Design Package

SFO SSTIK RNAV DP (formerly SFO PORTE SID and SFO OFFSHORE SID)

NorCal Design Team Reference: SFO_SSTIK_DP_ver6.3

Review Signatures

The D&I Team reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

 Patricia Daniel, FAA Lead Northern California OAPM	 Date	 Steven Hefley, NATCA Lead Northern California OAPM	 Date
 John F. Fisher, Facility POC Oakland ARTCC	 Date	 Robert Newray, NATCA POC Oakland ARTCC	 Date
 Paul Pegadiotes, Facility POC Northern California TRACON	 Date	 Richard Hull, NATCA POC Northern California TRACON	 Date
 Mark Paulus, Facility Lead San Francisco Tower	 Date	 Lisa Stephenson, NATCA Lead San Francisco Tower	 Date

Northern California (NorCal) OAPM Design Package

SFO STLER STAR (formerly SFO STINS STAR)

NorCal SFO_STLER_STAR_Ver 6.3 SFO_STLER_STAR_ver6.3

Name of Change	Date
SFO STLER STAR	12/21/2012
Change Classification	Current Phase of Design
Terminal Procedure STAR	<input type="checkbox"/> Preliminary Design (PD) <input type="checkbox"/> Operational Design (OD) <input type="checkbox"/> Operational Design Complete (ODC) <input checked="" type="checkbox"/> Proposed Final Design (PFD)
OAPM Study Team Reference(s)	Implementation Date
None	2014
Affected Facilities and Positions, Areas, and/or Sectors	Facility Points of Contact
Oakland ARTCC (ZOA): Sectors: 31-Red Bluff High 36-Mendocino High 41 Northern California TRACON (NCT): Sectors: Boulder	ZOA: James Meadows 510-745-3469 Robert Newray 510-918-6859 NCT: Paul Pegadiotes 916-366-4048 Richard Hull 916-201-3206
Related/Dependent Submissions	Associated Data Files
NCT East Plan Airspace Change	Master Targets File

Purpose

The purpose of the proposed procedure is to enhance the current conventional SFO STLER STAR (Figure 1) and address the following items identified by the NorCal OAPM Design Team:

- Flight Tracks do not follow published route.
- Lack of repeatable predictable flight paths.
- Optimization of lateral/vertical flight paths.
- Procedurally de-conflict from other area STARs.
- Efficient Cost to Carry (CTC) fuel planning.
- Use of Performance Based Navigation (PBN).

NorCal SFO_STLER_STAR_Ver 6.3 SFO_STLER_STAR_ver6.3



The NorCal Study Team did not provide recommendation on this particular procedure, however after further analysis the NorCal Design Team proposed a new procedure to optimize and add efficiency to current operations.

Northern California (NorCal) OAPM Design Package

SFO STLER STAR (formerly SFO STINS STAR)

NorCal SFO_STLER_STAR_Ver 6.3 SFO_STLER_STAR_ver6.3

Proposed Final Design

The NorCal Design Team is proposing the creation of a new RNAV STAR to be named the SFO STLER STAR (Figure 2). The SFO STINS STAR will continue to be used by aircraft unable to utilize Performance Based Navigation (PBN) procedures. Design enhancements and benefits include:

- Use of Performance Based Navigation (PBN).
- Optimization of lateral/vertical flight paths.
- Elimination of ground based Navaid dependency.
- Predictable and repeatable flight tracks.
- Reduction in controller workload and controller/pilot transmissions.
- Efficient Cost to Carry (CTC) fuel planning.
- Four new transitions.

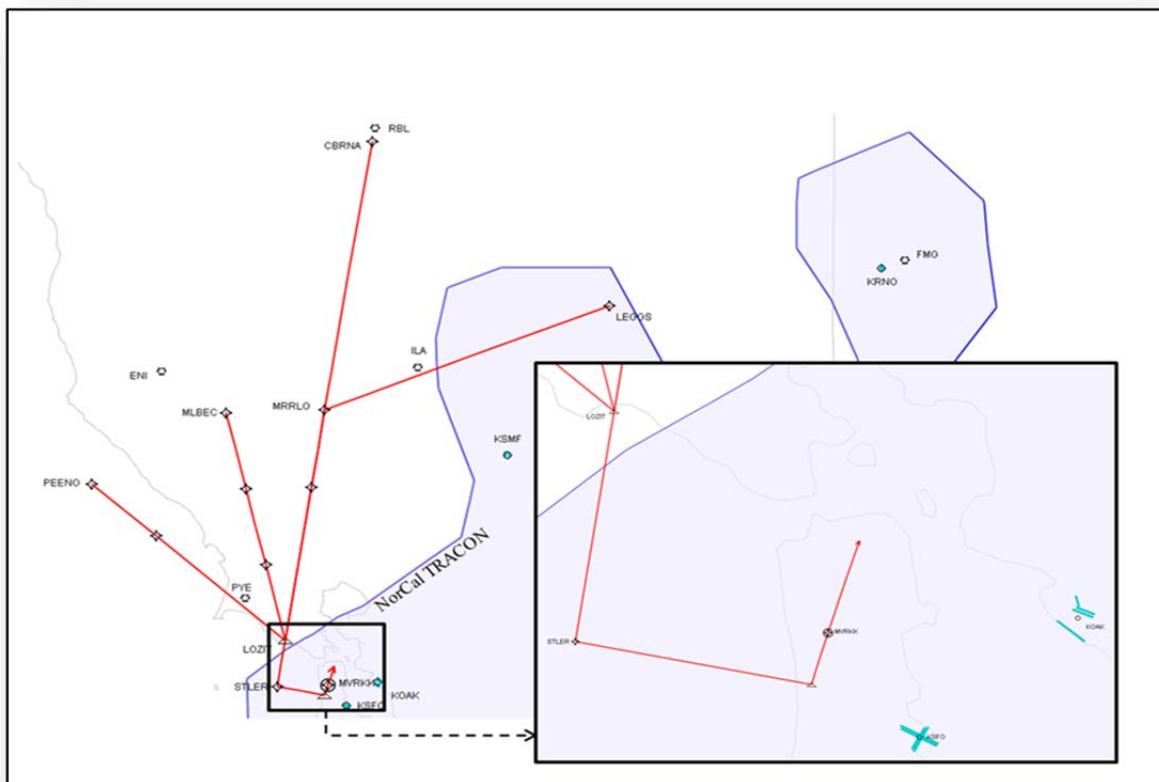


Figure 2: Proposed Procedure

Northern California (NorCal) OAPM Design Package

SFO STLER STAR (formerly SFO STINS STAR)

NorCal SFO_STLER_STAR_Ver 6.3 SFO_STLER_STAR_ver6.3

Additional Design Considerations

The proposed changes do not require a spectrum analysis.

Implementation Dependencies

The SFO STLER STAR is not dependent on any other proposed designs, and can be submitted separately from all other proposed designs as soon as practical for action/processing.

This proposed design requires amendments/modifications to:

- NCT and ZOA Standard Operating Procedures (SOP).
- NCT/ZOA Letters of Agreement (LOA).
- NCT East Plan Airspace.

No additional staffing, facilities or equipment is anticipated for this proposed design.

Attachments

Terminal Procedures:

- TARGETS Distribution Package.
- Flight Simulator Worksheet.
- RNAV Pro analysis results.

.

Northern California (NorCal) OAPM Design Package

SFO STLER STAR (formerly SFO STINS STAR)

NorCal SFO STLER STAR Ver 6.3.docx SFO_STLER_STAR_ver6.3

Review Signatures

The D&I Team reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.



Patricia Daniel, FAA Lead
Northern California OAPM

1-24-13

Date



Steven Hefley, NATCA Lead
Northern California OAPM

1/24/13

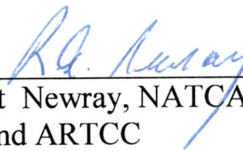
Date



John F. Fisher, Facility POC
Oakland ARTCC

1/24/13

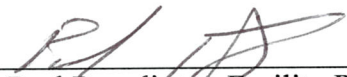
Date



Robert Newray, NATCA POC
Oakland ARTCC

1/24/13

Date



Paul Pegadiotes, Facility POC
Northern California TRACON

1/24/13

Date



Richard Hull, NATCA POC
Northern California TRACON

1/24/13

Date

Northern California (NorCal) OAPM Design Package

SFO TRUKN RNAV DP (formerly SFO SAN FRANCISCO SID and SFO SHORELINE SID)

NorCal Design Team Reference: SFO_TRUKN_DP_ver6.3

Name of Change	Date
SFO TRUKN RNAV DP	12/21/2012
Change Classification	Current Phase of Design
Terminal Departure Procedure (DP)	<input type="checkbox"/> Preliminary Design (PD) <input type="checkbox"/> Operational Design (OD) <input type="checkbox"/> Operational Design Complete (ODC) <input checked="" type="checkbox"/> Proposed Final Design (PFD)
OAPM Study Team Reference(s)	Implementation Date
4.1.2.2 / 4.1.2.3	2014
Affected Facilities and Positions, Areas, and/or Sectors	Facility Points of Contact
Oakland ARTCC (ZOA): Sectors: 29-Linden High 31-Red Bluff High 41 Northern California TRACON (NCT): Sectors: Fairfield Kirkwood Paradise Quake Richmond Diablo San Francisco Tower (SFO)	ZOA: James Meadows 510-745-3469 Robert Newray 510-918-6859 NCT: Paul Pegadiotes 916-366-4048 Richard Hull 916-201-3206 SFO: Mark Paulus 650-876-2883 X108 David Caldwell 209-602-1834
Related/Dependent Submissions	Associated Data Files
Amended entry points: Q route 128/130 NCT West Plan Airspace Change	Master Targets File

Purpose

The purpose of the proposed procedure is to enhance the current conventional SFO SAN FRANCISCO and SFO SHORELINE SIDs (Figure 1) and address the following items identified by the NorCal OAPM Study and Design Teams:

- Flight Tracks do not follow published route.
- Lack of repeatable predictable flight paths.
- Efficient Cost to Carry (CTC) fuel planning.
- Optimization of lateral/vertical flight paths.

Northern California (NorCal) OAPM Design Package

SFO TRUKN RNAV DP (formerly SFO SAN FRANCISCO SID and SFO SHORELINE SID)

NorCal Design Team Reference: SFO_TRUKN_DP_ver6.3

- Use of Performance Based Navigation (PBN).

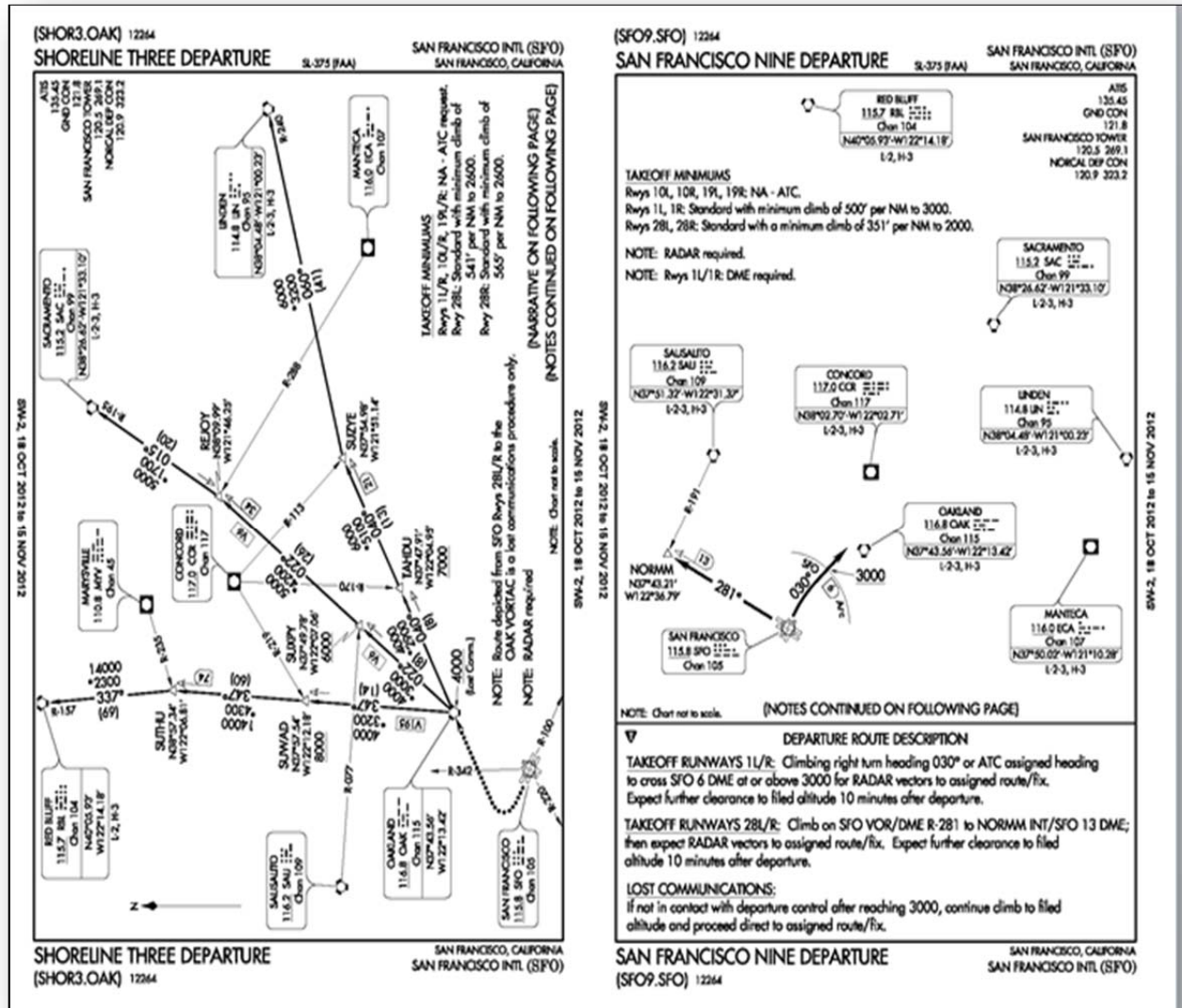


Figure 1: Current Procedures

Study Team Recommendation

The NorCal OAPM Study Team made the following recommendations to address the issues identified for the SAN FRANCISCO SID only, as the SFO Shoreline SID was not addressed:

- Create a new SFO RNAV SID.
- De-conflicted from other STARs/SIDs.
- Align new RNAV DP procedures with current traffic flows.

Northern California (NorCal) OAPM Design Package

SFO TRUKN RNAV DP (formerly SFO SAN FRANCISCO SID and SFO SHORELINE SID)

NorCal Design Team Reference: SFO_TRUKN_DP_ver6.3

- En Route transitions are increased from three to eight.
- Northeast transitions leverage the new Q-Routes from Sacramento (SAC) VOR, Linden VOR (LIN), MOGEE and TIPRE.
- Create an RNAV SID that provides a predictable, repeatable path.

Figure 2 and Figure 3 illustrate the proposed routes (dashed red), as well as current tracks (blue).

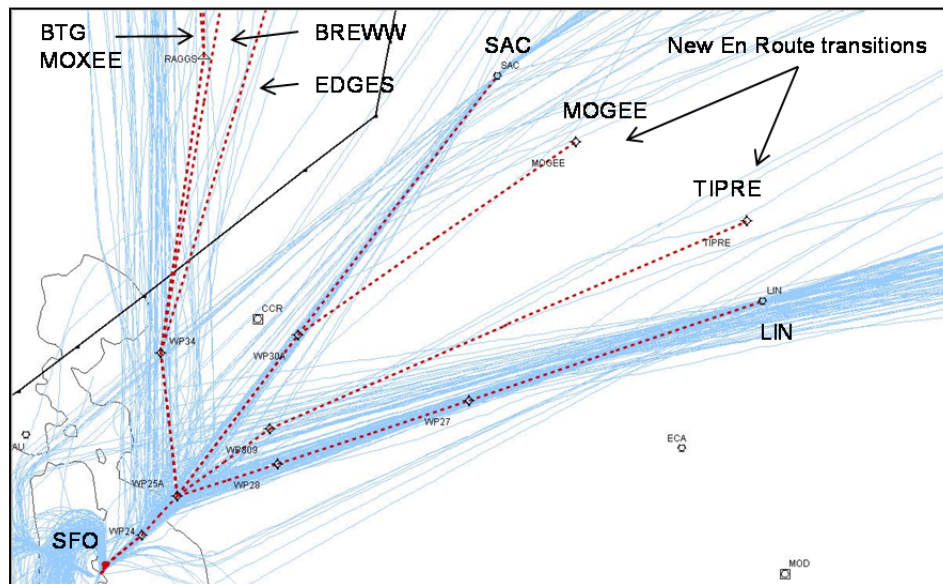


Figure 2: Primary Study Team Recommendation

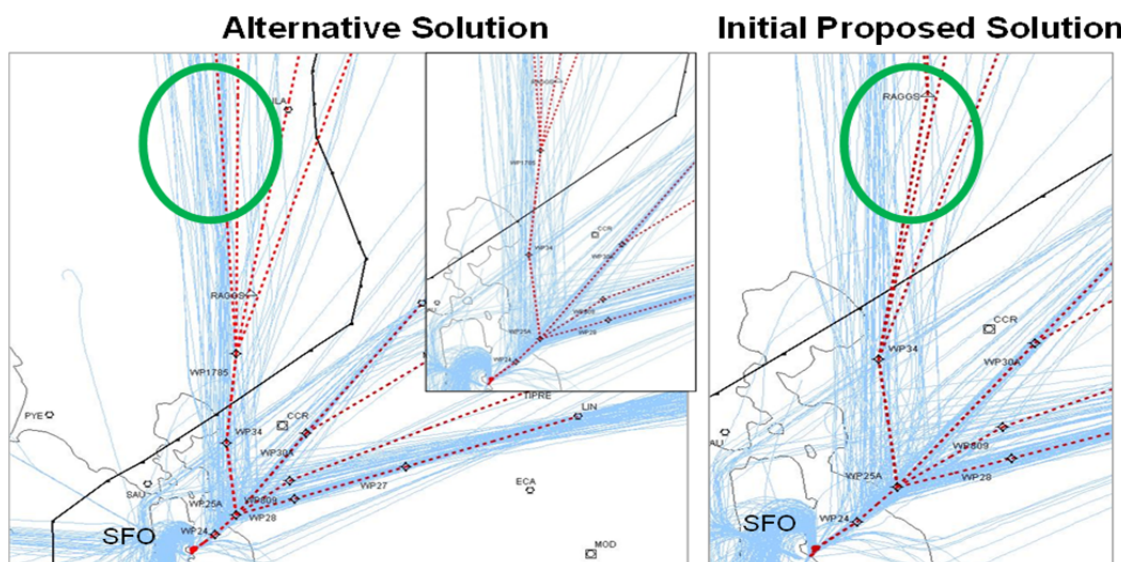


Figure 3: Study Team Recommendation Alternative Proposal

Northern California (NorCal) OAPM Design Package

SFO TRUKN RNAV DP (formerly SFO SAN FRANCISCO SID and SFO SHORELINE SID)

NorCal Design Team Reference: SFO_TRUKN_DP_ver6.3

Proposed Final Design

The NorCal Design Team is proposing the creation of a new RNAV procedure to be named the SFO TRUKN RNAV DP (Figure 4). The new design combines into a single RNAV DP the current conventional SFO SAN FRANCISCO and the SFO SHORELINE SIDs. The SFO9 and SFO SHORELINE SID will continue to be used by aircraft unable to utilize Performance Based Navigation (PBN) procedures. The new design elements and benefits include:

- Use of Performance Based Navigation (PBN).
- Optimization of lateral flight paths.
- Elimination of ground based Navaid dependency.
- Predictable and repeatable flight tracks.
- Reduction in controller workload and controller/pilot transmissions.
- Efficient Cost to Carry (CTC) fuel planning.
- Combines the SFO SAN FRANCISCO SID and the Runway 28 SHORELINE SID.
- Six optimized transitions improving flow efficiency and flexibility
- Routes are designed to maximize efficiencies utilizing expanded terminal to en route transitional separation (3 NM increasing to 5 NM).

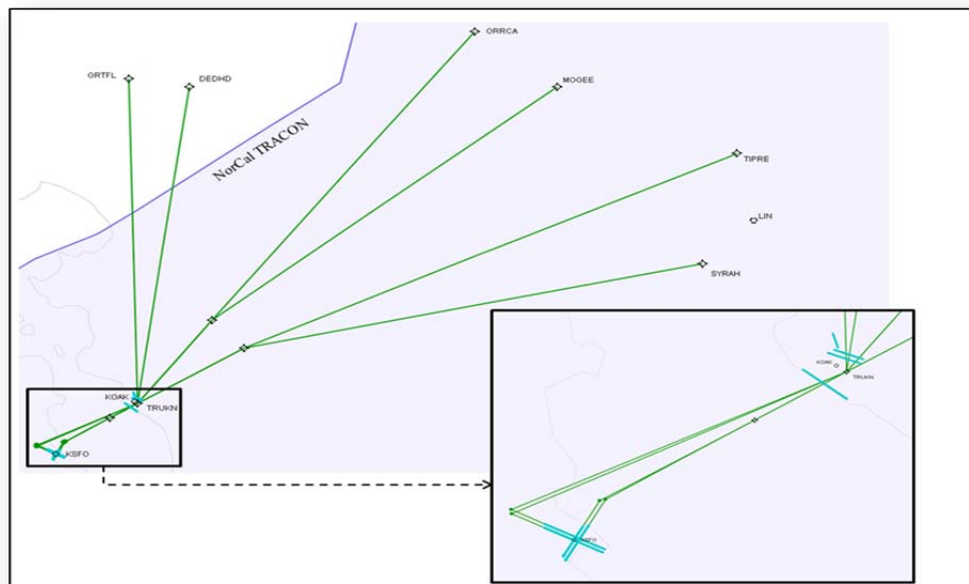


Figure 4: Proposed Procedure

Northern California (NorCal) OAPM Design Package

SFO TRUKN RNAV DP (formerly SFO SAN FRANCISCO SID and SFO SHORELINE SID)

NorCal Design Team Reference: SFO_TRUKN_DP_ver6.3

The proposed SFO TRUKN RNAV DP design differences include:

- The new SYRAH Waypoint southwest of LINDEN (LIN) accommodates current traffic flow tracks and will become the entry point for the Q routes (128/130) in NCT/ZOA airspace.
- The Design Team determined that the four routes proposed by the Study Team to the Northwest did not provide adequate course divergence.
- The Design Team proposal consists of a total of six departure routes as opposed to the eight departure routes proposed by the Study Team.
- The Design Team proposal consists of two departure routes to the northwest which provide lateral separation.
- The Design Team moved the transition point closer to the runway in order to utilize earlier course divergence and created six departure flows.
- Combines the SFO SAN FRANCISCO SID and the Runway 28 SHORELINE SID.

Additional Design Considerations

Validation of the proposed design has been accomplished through Human-in-the-Loop (HITL) simulations.

The proposed changes do not require a spectrum analysis.

Implementation Dependencies

The SFO TRUKN RNAV DP is not dependent on any other proposed designs, can be submitted separately as soon as practical for action/processing.

This proposed design requires amendments/modifications to:

- ARTCC Q Route changes (ZOA to adjust Q Route 128/130) which is currently being processed by ZOA 530.
- SFO, ZOA, and NCT Standard Operating Procedures (SOP).
- ZOA/NCT and NCT/SFO Letters of Agreement (LOA).
- Automation.
- NCT West Plan Airspace.

No additional staffing, facilities or equipment is anticipated for this proposed design.

Northern California (NorCal) OAPM Design Package

SFO TRUKN RNAV DP (formerly SFO SAN FRANCISCO SID and SFO SHORELINE SID)

NorCal Design Team Reference: SFO_TRUKN_DP_ver6.3

Attachments

Terminal Procedures:

- TARGETS Distribution Package.
- Flight Simulator Worksheet.
- RNAV Pro analysis results.
- HITL Documentation.

Northern California (NorCal) OAPM Design Package

SFO TRUKN RNAV DP (formerly SFO SAN FRANCISCO SID and SFO SHORELINE SID)

NorCal Design Team Reference: SFO_TRUKN_DP_ver6.3

Review Signatures

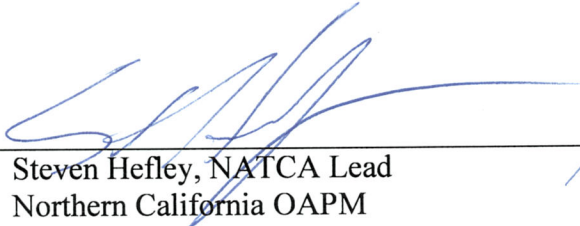
The D&I Team reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.



Patricia Daniel, FAA Lead
Northern California OAPM

1-24-13


Date



Steven Hefley, NATCA Lead
Northern California OAPM

1/24/13

Date


John F. Fisher, Facility POC
Oakland ARTCC

1/24/13


Date



Robert Newray, NATCA POC
Oakland ARTCC

1/24/13

Date


Paul Pegadiotes, Facility POC
Northern California TRACON

1/24/13

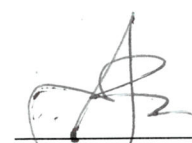
Date



Richard Hull, NATCA POC
Northern California TRACON

1/24/13

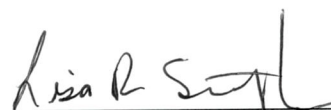
Date



Mark Paulus, Facility Lead
San Francisco Tower

1/17/13

Date



Lisa Stephenson, NATCA Lead
San Francisco Tower

1-17-13

Date

Northern California (NorCal) OAPM Design Package

SFO WESLA RNAV DP (formerly SFO PORTE SID and SFO OFFSHORE SID)

NorCal Design Team Reference: SFO_WESLA_DP_ver6.3

Name of Change	Date
SFO WESLA RNAV DP	12/21/2012
Change Classification	Current Phase of Design
Terminal Departure Procedure (DP)	<input type="checkbox"/> Preliminary Design (PD) <input type="checkbox"/> Operational Design (OD) <input type="checkbox"/> Operational Design Complete (ODC) <input checked="" type="checkbox"/> Proposed Final Design (PFD)
OAPM Study Team Reference(s)	Implementation Date
4.1.2.1	2014
Affected Facilities and Positions, Areas, and/or Sectors	Facility Points of Contact
Oakland ARTCC (ZOA): Sectors: 11 13-PANOCHÉ HIGH 14-BIG SUR HIGH 15-CLOVIS HIGH 22 35 Northern California TRACON (NCT): Sectors: SUTRO, QUAKE San Francisco Tower (SFO)	ZOA: James Meadows 510-745-3469 Robert Newray 510-918-6859 NCT: Paul Pegadiotes 916-366-4048 Richard Hull 916-201-3206 SFO: Mark Paulus 650-876-2883 X108 David Caldwell 209-602-1834
Related/Dependent Submissions	Associated Data Files
NCT West Plan Airspace Change	Master Targets File

Purpose

The purpose of the proposed procedure is to enhance the current conventional SFO PORTE and SFO OFFSHORE SIDs (Figure 1) and address the following items identified by the NorCal OAPM Study and Design Teams:

- Rely on initial radar vectors to the designated exit fix.
- Flight Tracks do not follow published route.
- Optimization of lateral/vertical flight paths.
- Multiple transitions go unused due to outdated legacy procedures.

Northern California (NorCal) OAPM Design Package

SFO WESLA RNAV DP (formerly SFO PORTE SID and SFO OFFSHORE SID)

NorCal Design Team Reference: SFO_WESLA_DP_ver6.3

- Excess fuel loading due to unused transitions.

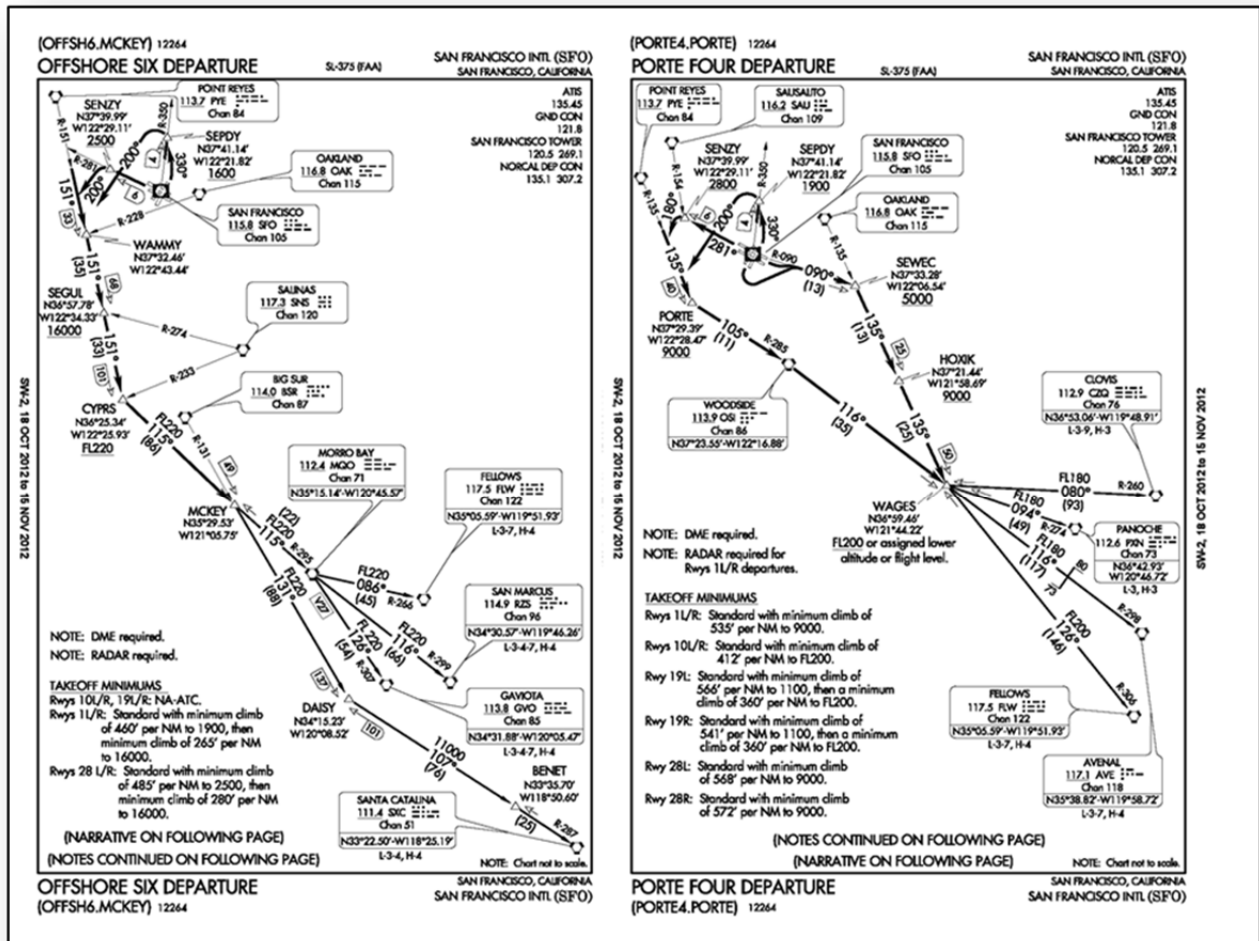


Figure 1: Current Procedures

Study Team Recommendation

The NorCal OAPM Study Team made the following recommendations to address the issues listed above for the SFO PORTE and OFFSH SID:

- Create a RNAV procedure combining the PORTE and OFFSH SID.
- De-conflicted from other STARs/SIDs.
- Align new RNAV DP procedures with current traffic flows.
- Create an RNAV SID that provides a predictable, repeatable path.
- En route departure transitions increased from four to six.

NorCal Design Team Reference: SFO_WESLA_DP_ver6.3

The map displays flight routes between Seoul and San Francisco. A red dotted line indicates a new direct route, which is 6.9NM shorter than the original route over Phoenix. A yellow line shows a new route from Seoul to Phoenix, which is 5.2NM shorter than the original route. A blue line represents the original route from Seoul to Phoenix to San Francisco. A callout box provides more details about the new routes.

New route 6.9NM shorter over CZO

Deleted PHX transition

New route 5.2NM shorter from SEOUL-MCXY

Proposed Final Design

The new design elements and benefits include:

Northern California (NorCal) OAPM Design Package

SFO WESLA RNAV DP (formerly SFO PORTE SID and SFO OFFSHORE SID)

NorCal Design Team Reference: SFO_WESLA_DP_ver6.3

- Use of Performance Based Navigation (PBN).
- Optimization of lateral flight paths.
- Elimination of ground based Navaid dependency.
- Predictable and repeatable flight tracks.
- Reduction in controller workload and controller/pilot transmissions.
- Efficient Cost to Carry (CTC) fuel planning.
- Combines the SFO PORTE SID and SFO OFFSHORE SID.
- Routes are designed to maximize efficiencies utilizing expanded terminal to en route transitional separation (3 NM increasing to 5 NM).

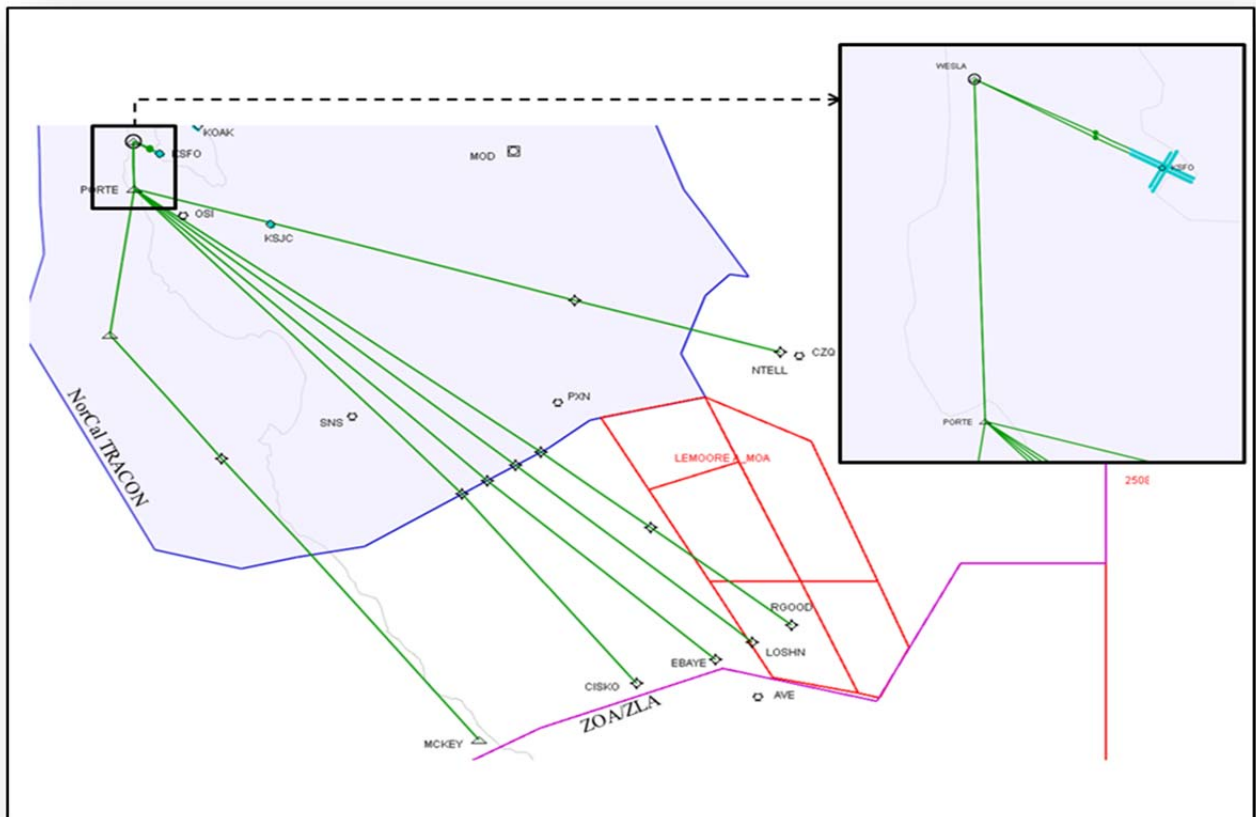


Figure 1: Proposed Procedure

Northern California (NorCal) OAPM Design Package

SFO WESLA RNAV DP (formerly SFO PORTE SID and SFO OFFSHORE SID)

NorCal Design Team Reference: SFO_WESLA_DP_ver6.3

Additional Design Considerations

Validation of the proposed design has been accomplished through Human-in-the-Loop (HITL) simulations.

The proposed changes do not require a spectrum analysis.

Implementation Dependencies

The SFO WESLA RNAV DP is not dependent on any other proposed designs and can be submitted separately as soon as practical for action/processing.

This proposed design requires amendments/modifications to:

- ZOA, NCT, and SFO Standard Operating Procedures (SOP).
- ZOA/NCT and NCT/SFO Letters of Agreement (LOA).
- Automation.
- NCT West Plan Airspace.

No additional staffing, facilities or equipment is anticipated for this proposed design.

Attachments

Terminal Procedures:

- TARGETS Distribution Package.
- Flight Simulator Worksheet.
- RNAV Pro analysis results.
- HITL Documentation.

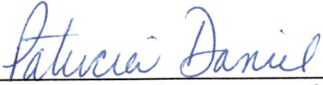

Northern California (NorCal) OAPM Design Package

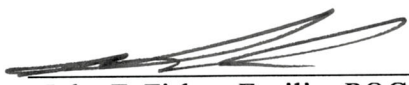
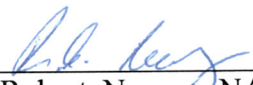
SFO WESLA RNAV DP (formerly SFO PORTE SID and SFO OFFSHORE SID)



NorCal Design Team Reference: SFO_WESLA_DP_ver6.3


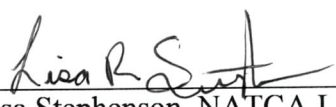
Review Signatures

The D&I Team reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

	
Patricia Daniel, FAA Lead Northern California OAPM	Steven Hefley, NATCA Lead Northern California OAPM
1-24-13	1/24/13
Date	Date

	
John F. Fisher, Facility POC Oakland ARTCC	Robert Newray, NATCA POC Oakland ARTCC
1/24/13	1/24/13
Date	Date

	
Paul Pegadiotes, Facility POC Northern California TRACON	Richard Hull, NATCA POC Northern California TRACON
1/24/13	1/24/13
Date	Date

	
Mark Paulus, Facility Lead San Francisco Tower	Lisa Stephenson, NATCA Lead San Francisco Tower
1-17-13	1-17-13
Date	Date

Northern California (NorCal) OAPM Design Package

SFO YOSEM STAR (Optimized SFO YOSEM STAR)

NorCal SFO_YOSEM_STAR_Ver 6.3 SFO_YOSEM_STAR_ver6.3

Name of Change	Date
SFO YOSEM STAR	12/21/2012
Change Classification	Current Phase of Design
Terminal Procedure STAR	<input type="checkbox"/> Preliminary Design (PD) <input checked="" type="checkbox"/> Operational Design (OD) <input type="checkbox"/> Operational Design Complete (ODC) <input type="checkbox"/> Proposed Final Design (PFD)
OAPM Study Team Reference(s)	Implementation Date
4.10.2	2014
Affected Facilities and Positions, Areas, and/or Sectors	Facility Points of Contact
Oakland ARTCC (ZOA): Sectors: 15-CLOVIS HIGH 33-COALDALE HIGH 34-MODESTO HIGH 46 Northern California TRACON (NCT): Sectors: CEDAR NILES	ZOA: Jim Meadows 510-745-3469 Bob Newray 510-918-6859 NCT: Paul Pegadiotes 916-366-4048 Richard Hull 916-201-3206
Related/Dependent Submissions	Associated Data Files
SMF SUTTR STAR NCT West Plan Airspace Change	Master Targets File

Purpose

The purpose of the proposed procedure is to enhance the current SFO YOSEM STAR (Figure 1) and address the following items identified by the NorCal OAPM Study and Design Teams:

- Actual flight tracks do not overfly current procedures.
- Inefficient vertical profile and level segments.

Northern California (NorCal) OAPM Design Package

SFO YOSEM STAR (Optimized SFO YOSEM STAR)

NorCal SFO_YOSEM_STAR_Ver 6.3 SFO_YOSEM_STAR_ver6.3

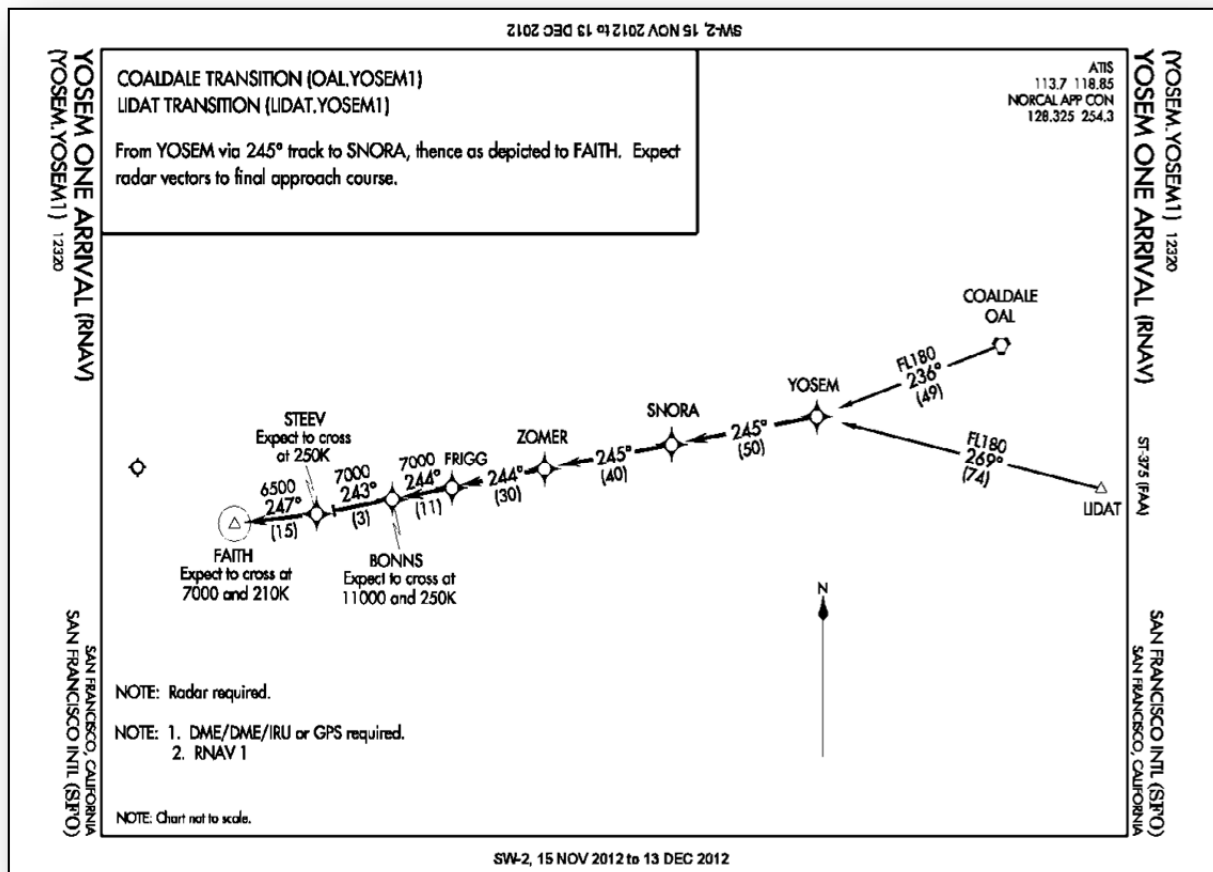


Figure 1: Current Procedure

Study Team Recommendation

The Study Team did not recommend any specific changes to the SFO YOSEM STAR; however recommendations were made for enhancing design procedures in the Bay Area:

- Create OPD benefits.
- Align with current flight paths.
- Eliminate unused transitions.
- Have predictable, repeatable path.
- Procedurally de-conflicted from other area arrivals.

Northern California (NorCal) OAPM Design Package

SFO YOSEM STAR (Optimized SFO YOSEM STAR)

NorCal SFO_YOSEM_STAR_Ver 6.3 SFO_YOSEM_STAR_ver6.3

Figure 2 illustrates the GOLDN and MOD (dashed green), the Study Team's hypothetical northern arrival route (solid purple), and the published YOSEM (solid red), as well as current arrival tracks (light green) and current departure tracks (light orange).

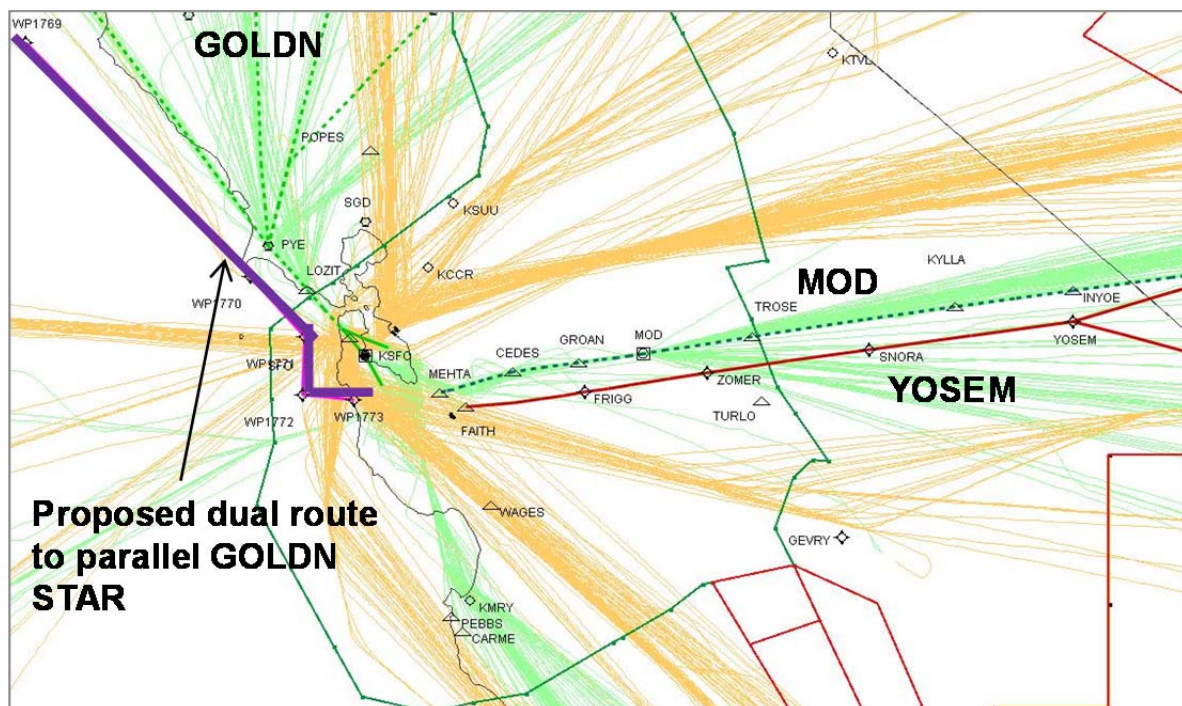


Figure 2: Study Team Proposal

Proposed Final Design

The NorCal Design Team is proposing to enhance the current RNAV SFO YOSEM STAR which will be used during SFO Runway 28 Simultaneous Visual Operations. This proposal is a Performance-Based Navigation (PBN) optimization of the current published SFO YOSEM STAR¹ depicted in Figure 2.

¹ The published YOSEM STAR is an ATC-assigned offload route providing dual arrival route capability from the East. It is used to relieve demand on the SFO MOD STAR which is the primary arrival route.

Northern California (NorCal) OAPM Design Package

SFO YOSEM STAR (Optimized SFO YOSEM STAR)

NorCal SFO_YOSEM_STAR_Ver 6.3 SFO_YOSEM_STAR_ver6.3

The new SFO YOSEM STAR is illustrated in Figure 3. The new design elements and benefits include:

- Straightens the route from YOSEM to FAITH.
- Additional RUSME transition for increased efficiency and mileage reduction.
- KICHI transition will allow for ZLC to offload SFO arrivals during peak traffic periods.
- De-conflicted from the OAK EMZOH, SFO DYAMD and SMF SUTTR STARS.
- Use of Performance Based Navigation (PBN).
- Optimization of lateral/vertical flight paths.
- Elimination of ground based Navaid dependency.
- Reduction in controller workload and controller/pilot transmissions.

There are no major differences between the Study Team recommendations and the Design Team's proposal outside of what is outlined above.

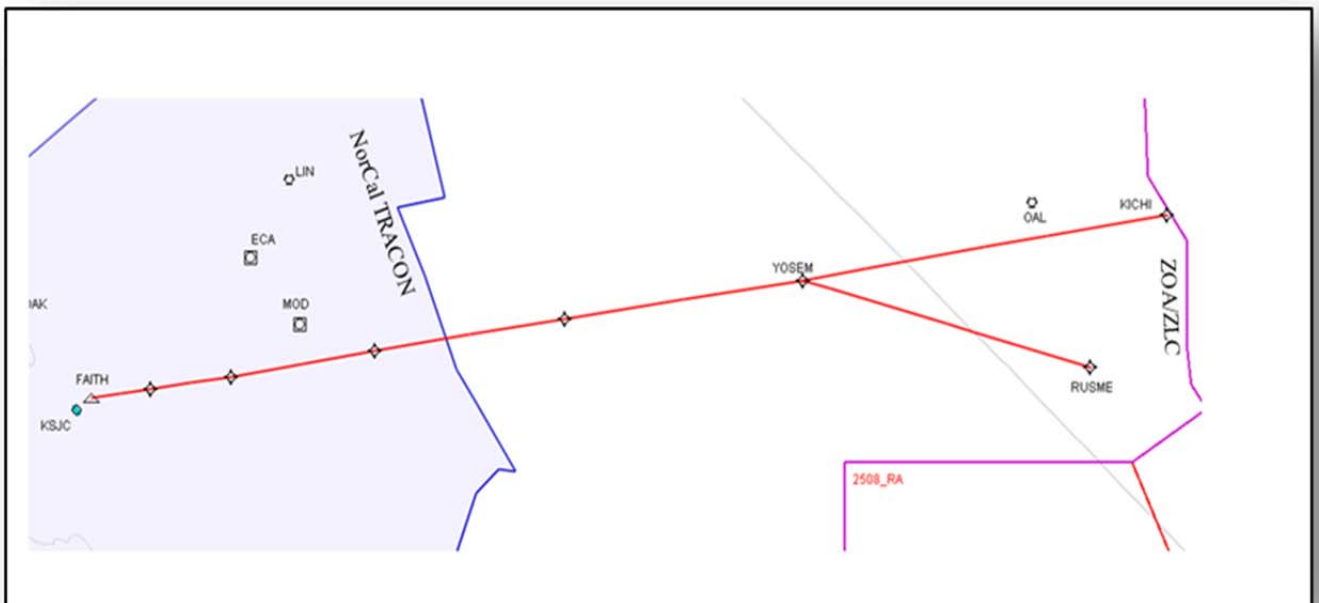


Figure 3: Proposed Procedure

Northern California (NorCal) OAPM Design Package

SFO YOSEM STAR (Optimized SFO YOSEM STAR)

NorCal SFO_YOSEM_STAR_Ver 6.3 SFO_YOSEM_STAR_ver6.3

Additional Design Considerations

Validation of the proposed design has been accomplished through Human-in-the-Loop (HITL) simulations.

The proposed changes do not require a spectrum analysis.

Implementation Dependencies

The proposed SFO YOSEM STAR is dependent on the SMF SUTTR STAR.

The proposed SFO YOSEM STAR cannot be submitted separately from all other proposed designs.

This proposed design requires amendments/modifications to:

- ZOA and NCT Standard Operating Procedures (SOP).
- ZOA/ZLC, ZOA/ZLA, ZOA/E10 and ZOA/NCT Letters of Agreement (LOA).
- Automation.
- NCT West Plan Airspace.

No additional staffing, facilities or equipment is anticipated for this proposed design.

Attachments

Terminal Procedures:

- TARGETS Distribution Package.
- Flight Simulator Worksheet.
- RNAV Pro analysis results.
- HITL simulation results.


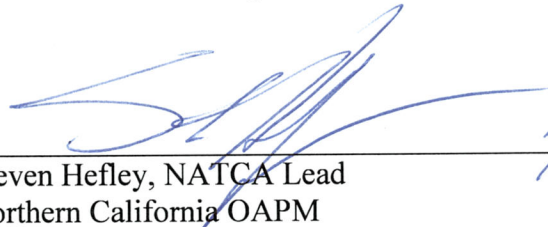
Northern California (NorCal) OAPM Design Package

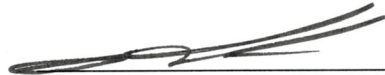
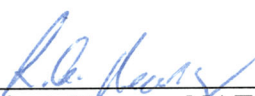
SFO YOSEM STAR (Optimized SFO YOSEM STAR)

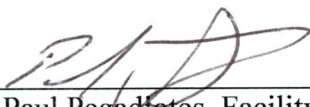

NorCal SFO YOSEM STAR Ver 6.3.docx SFO_YOSEM_STAR_ver6.3

Review Signatures

The D&I Team reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

	1-24-13		1/24/13
Patricia Daniel, FAA Lead Northern California OAPM	Date	Steven Hefley, NATCA Lead Northern California OAPM	Date

	1/24/13		1/24/13
John F. Fisher, Facility POC Oakland ARTCC	Date	Robert Newray, NATCA POC Oakland ARTCC	Date

	1/24/13		1/24/13
Paul Pegadotes, Facility POC Northern California TRACON	Date	Richard Hull, NATCA POC Northern California TRACON	Date

Northern California (NorCal) OAPM Design Package

SJC ALMDN RNAV DP (formerly the SJC ALTAM SID)

NorCal SJC_ALMDN_DP_Ver 6.3 SJC_ALMDN_DP_ver6.3

Name of Change	Date
SJC ALMDN RNAV DP	12/21/2012
Change Classification	Current Phase of Design
Terminal Procedure DP	<input type="checkbox"/> Preliminary Design (PD) <input type="checkbox"/> Operational Design (OD) <input type="checkbox"/> Operational Design Complete (ODC) <input checked="" type="checkbox"/> Proposed Final Design (PFD)
OAPM Study Team Reference(s)	Implementation Date
None	2014
Affected Facilities and Positions, Areas, and/or Sectors	Facility Points of Contact
Oakland ARTCC (ZOA): Sectors: 29-Linden High 31-Red Bluff High 32 41 Northern California TRACON (NCT): Sectors: Toga Fairfield Richmond San Jose Tower (SJC)	ZOA: James Meadows 510-745-3469 Robert Newray 510-918-6859 NCT: Paul Pegadiotes 916-366-4048 Richard Hull 916-201-3206 SJC: Corey McCauley 408-982-0750 Richard Burton 408-857-3544
Related/Dependent Submissions	Associated Data Files
Amended Entry Points: Q Route 128/130 NCT East Plan Airspace Change	Master TARGETS File

Purpose

The purpose of the proposed procedure is to enhance the current conventional SJC ALTAM STAR (Figure 1) and address the following items identified by the NorCal OAPM Design Team:

- Flight Tracks do not follow published route.
- Lack of repeatable predictable flight paths.
- Optimization of lateral/vertical flight paths.

Northern California (NorCal) OAPM Design Package

SJC ALMDN RNAV DP (formerly the SJC ALTAM SID)

NorCal SJC_ALMDN_DP_Ver 6.3 SJC_ALMDN_DP_ver6.3

- Procedurally de-conflict from other area STARs.
- Efficient Cost to Carry (CTC) fuel planning.
- Use of Performance Based Navigation (PBN).

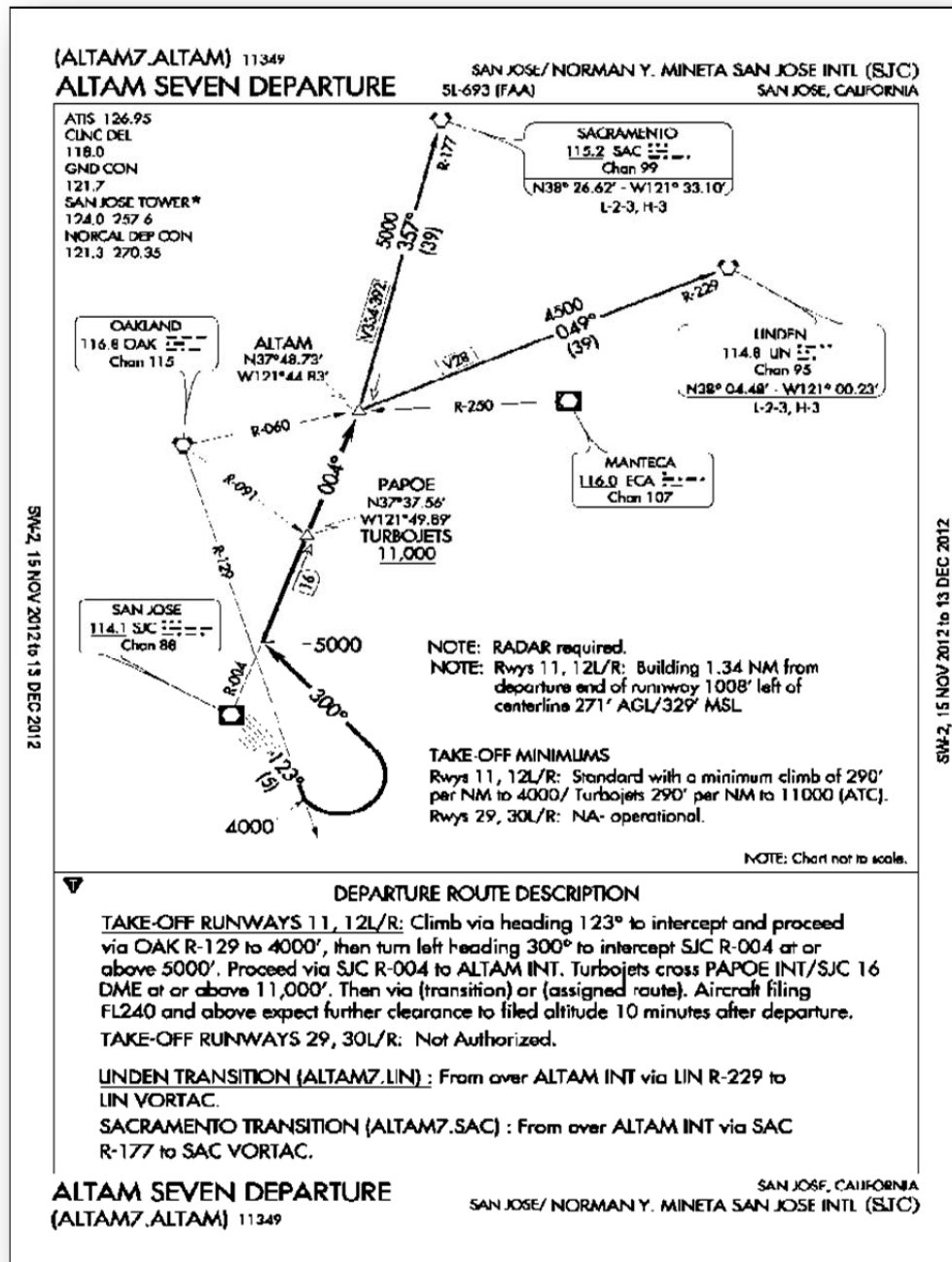


Figure 1: Current Procedure

Northern California (NorCal) OAPM Design Package

SJC ALMDN RNAV DP (formerly the SJC ALTAM SID)

NorCal SJC_ALMDN_DP_Ver 6.3 SJC_ALMDN_DP_ver6.3

Study Team Recommendation

The NorCal Study Team did not provide recommendation on this particular procedure, however after further analysis the NorCal Design Team proposed a new procedure to optimize and add efficiency to current operations.

Proposed Final Design

The NorCal Design Team is proposing the creation of the new SJC ALMDN RNAV DP (Figure 2). The current conventional SJC ALTAM SID will continue to be used by aircraft unable to utilize Performance Based Navigation (PBN) procedures during southeast configuration operations.

The design elements and benefits include:

- Deconflicted from the SAHEY procedure.
- Expanded the number of departure routes from two to five.
- Use of Performance Based Navigation (PBN).
- Optimization of lateral flight paths.
- Elimination of ground based Navaid dependency.
- Predictable and repeatable flight tracks.
- Reduction in controller workload and controller/pilot transmissions.
- Efficient Cost to Carry (CTC) fuel planning.
- Routes are designed to maximize efficiencies utilizing expanded terminal to En route transitional separation (3 NM increasing to 5 NM).

Northern California (NorCal) OAPM Design Package

SJC ALMDN RNAV DP (formerly the SJC ALTAM SID)

NorCal SJC_ALMDN_DP_Ver 6.3 SJC_ALMDN_DP_ver6.3

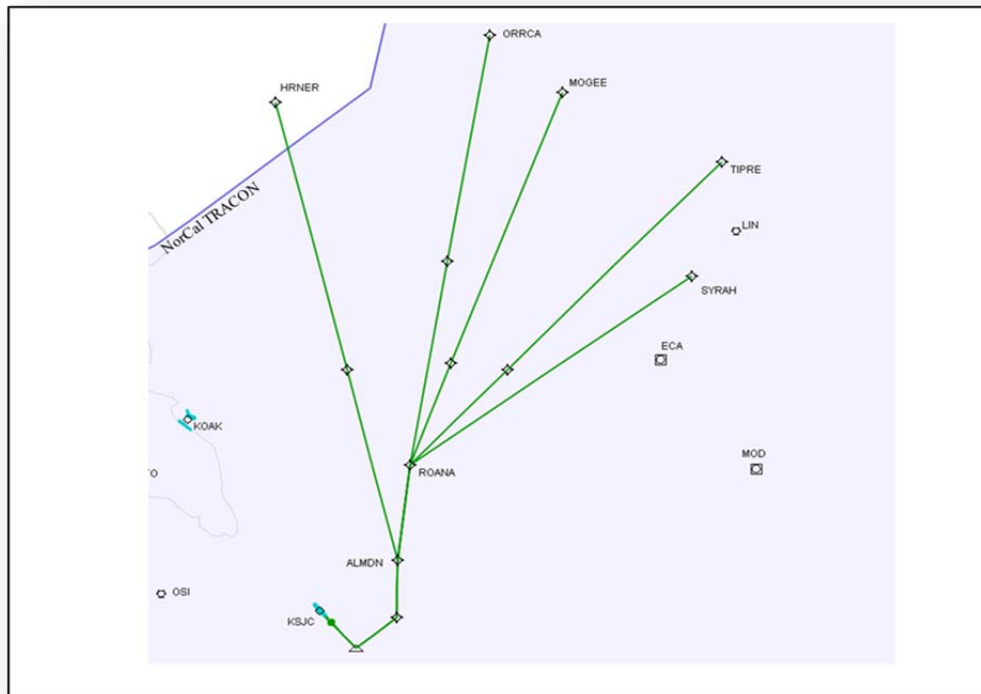


Figure 1: Proposed Procedure

Additional Design Considerations

Validation of the proposed design has been accomplished through Human-in-the-Loop (HITL) simulations.

The proposed changes do not require a spectrum analysis.

Implementation Dependencies

The SJC ALMDN RNAV DP is not dependent on any other proposed designs and can be submitted separately from all other proposed designs as soon as practical for action/processing.

This proposal requires modifications to:

- SJC, ZOA, and NCT Standard Operating Procedures (SOP).
- ZOA/NCT and NCT/SJC Letters of Agreement (LOA).

Northern California (NorCal) OAPM Design Package

SJC ALMDN RNAV DP (formerly the SJC ALTAM SID)

NorCal SJC_ALMDN_DP_Ver 6.3 SJC_ALMDN_DP_ver6.3

- Entry point of two Q routes (128/130) in NCT/ZOA airspace.
- NCT East Plan Airspace.

No additional staffing, facilities or equipment is anticipated for this proposed design.

Attachments

Terminal Procedures:

- TARGETS Distribution Package.
- Flight Simulator Worksheet.
- RNAV Pro analysis results.


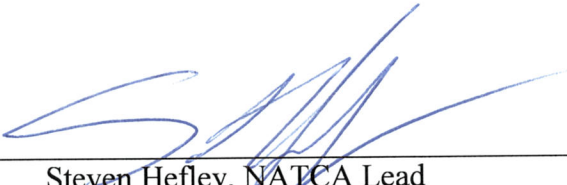

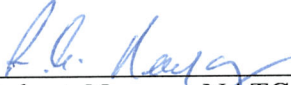
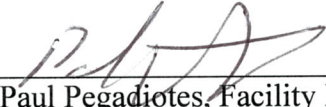
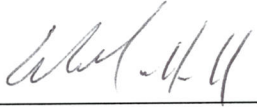
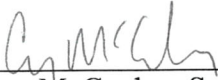
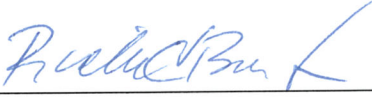
Northern California (NorCal) OAPM Design Package

SJC ALMDN RNAV DP (formerly the SJC ALTAM SID)

NorCal SJC ALMDN DP Ver 6.3.docx SJC_ALMDN_DP_ver6.3

Review Signatures

The D&I Team reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

 Patricia Daniel, FAA Lead Northern California OAPM	1-24-13 Date	 Steven Hefley, NATCA Lead Northern California OAPM	1/24/13 Date
 John F. Fisher, Facility POC Oakland ARTCC	1/24/13 Date	 Robert Newray, NATCA POC Oakland ARTCC	1/24/13 Date
 Paul Pegadiotes, Facility POC Northern California TRACON	1/24/13 Date	 Richard Hull, NATCA POC Northern California TRACON	1/24/13 Date
 Corey McCauley, San Jose Tower Facility Lead	1/17/2013 Date	 Richard Burton, San Jose Tower NATCA Lead	1/17/2013 Date

Northern California (NorCal) OAPM Design Package

SJC BMRNG RNAV DP (formerly SJC LOUPE SID and SJC DANVILLE SID)

NorCal SJC_BMRNG_DP_Ver 6.3

Name of Change	Date
SJC BMRNG RNAV DP	12/21/2012
Change Classification	Current Phase of Design
Terminal Procedure DP	<input type="checkbox"/> Preliminary Design (PD) <input type="checkbox"/> Operational Design (OD) <input type="checkbox"/> Operational Design Complete (ODC) <input checked="" type="checkbox"/> Proposed Final Design (PFD)
OAPM Study Team Reference(s)	Implementation Date
4.3.2.2	2014
Affected Facilities and Positions, Areas, and/or Sectors	Facility Points of Contact
Oakland ARTCC (ZOA): Sectors: 11 29-Linden High 31-Red Bluff High 32 41 Northern California TRACON (NCT): Sectors: Toga Quake Fairfield Richmond San Jose Tower (SJC)	ZOA: John Fisher 510-745-3469 Robert Newray 510-918-6859 NCT: Paul Pegadiotes 916-366-4048 Richard Hull 916-201-3206 SJC: Corey McCauley 408-982-0750 Richard Burton 408-857-3544
Related/Dependent Submissions	Associated Data Files
Amended Entry Points: Q Route 128/130 NCT West and 12-West Airspace Plan changes	Master Targets File

Purpose

The purpose of the proposed procedure is to enhance the current SJC LOUPE and SJC DANVILLE SIDs (Figure 1) and address the following items identified by the NorCal OAPM Study and Design Teams:

- Flight Tracks do not follow published route.
- Lack of repeatable predictable flight paths.
- Optimization of lateral/vertical flight paths.

Northern California (NorCal) OAPM Design Package

SJC BMRNG RNAV DP (formerly SJC LOUPE SID and SJC DANVILLE SID)

NorCal SJC_BMRNG_DP_Ver 6.3

- Procedurally de-conflict from other area STARs.
- Efficient Cost to Carry (CTC) fuel planning.
- Use of Performance Based Navigation (PBN).

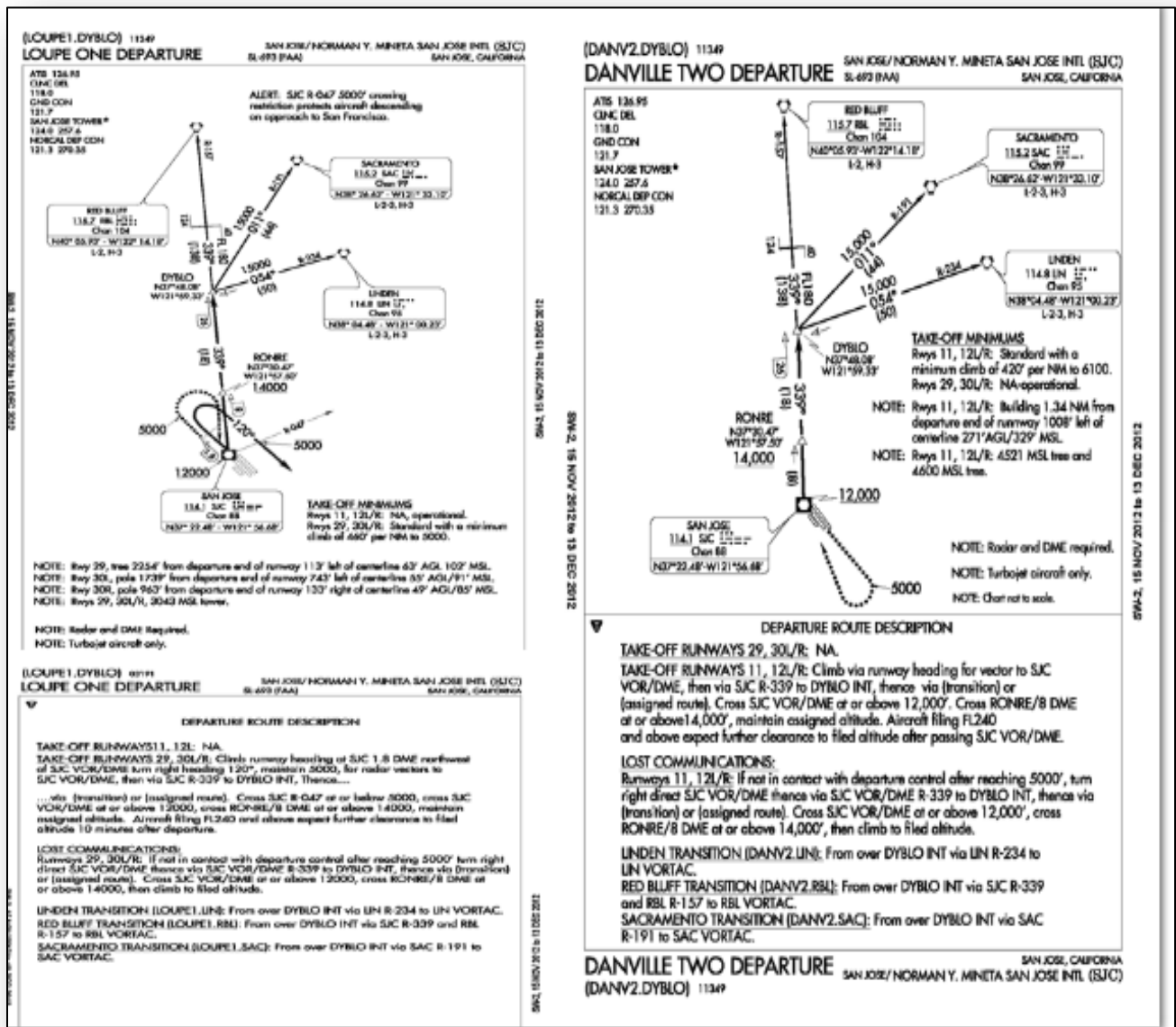


Figure 1: Current Procedures

Northern California (NorCal) OAPM Design Package

SJC BMRNG RNAV DP (formerly SJC LOUPE SID and SJC DANVILLE SID)

NorCal SJC_BMRNG_DP_Ver 6.3

Study Team Recommendation

The NorCal OAPM Study Team made the following recommendations¹ for the improved redesign of SJC departures:

- Create a new RNAV procedure.
- Have predictable repeatable paths.
- En route departure transitions increased from three to eight.
- Align new RNAV DP procedures with current traffic flows.

Figure 2 illustrates the published SJC LOUPE procedure (solid purple) and the proposed routes (dashed blue), as well as current tracks (teal).

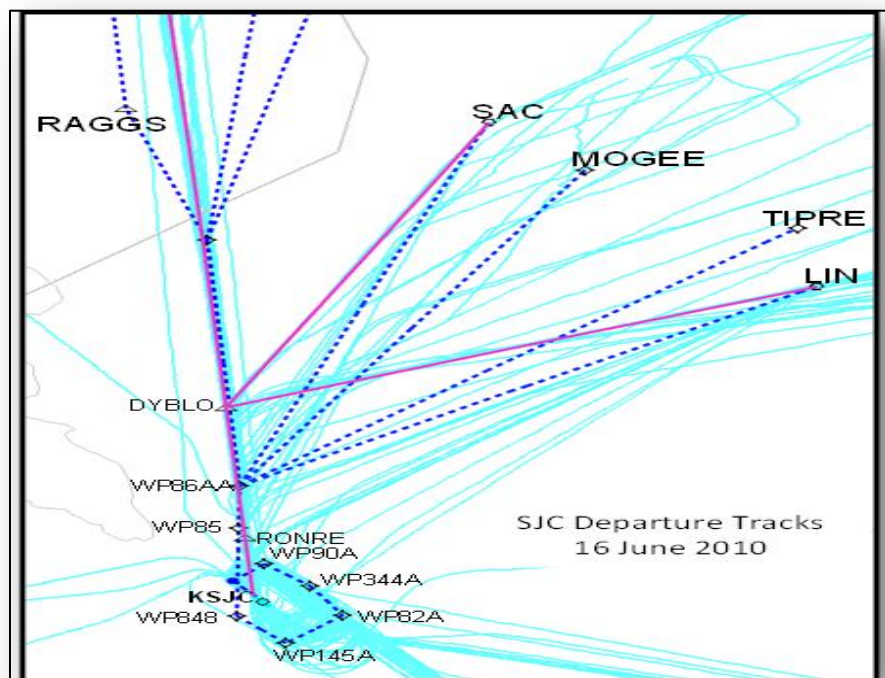


Figure 2: Study Team Recommendation

¹ The NorCal OAPM Study Team analyzed the SJC Loupe SID only.

Northern California (NorCal) OAPM Design Package

SJC BMRNG RNAV DP (formerly SJC LOUPE SID and SJC DANVILLE SID)

NorCal SJC_BMRNG_DP_Ver 6.3

Proposed Final Design

The NorCal Design Team is proposing the creation of the new RNAV SJC BMRNG DP (Figure 3). The new design will combine the conventional SJC DANVILLE SID and SJC LOUPE SID into a single new RNAV procedure. These conventional procedures will continue to be used by aircraft unable to utilize Performance Based Navigation (PBN) procedures. The design elements and benefits include:

- A single procedure combining the current SJC LOUPE SID and SJC DANVILLE SID.
- Can be utilized in either a West Plan or a 12 West configuration.
- Requires ATC clearance for turn back to BMRNG.
- Expands the current number of departure routes from three to five.
- Use of Performance Based Navigation (PBN).
- Optimization of lateral flight paths.
- Elimination of ground based Navaid dependency.
- Predictable and repeatable flight tracks.
- Reduction in controller workload and controller/pilot transmissions.
- Efficient Cost to Carry (CTC) fuel planning.
- Routes are designed to maximize efficiencies utilizing expanded terminal to en route transitional separation (3 NM increasing to 5 NM).

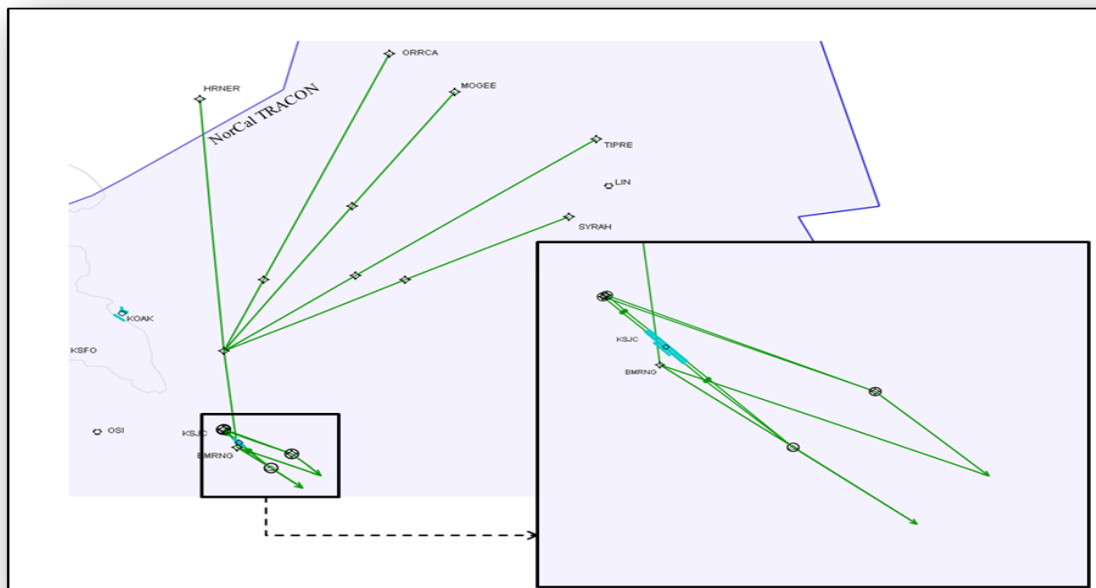


Figure 3: Proposed Procedure

Northern California (NorCal) OAPM Design Package

SJC BMRNG RNAV DP (formerly SJC LOUPE SID and SJC DANVILLE SID)

NorCal SJC_BMRNG_DP_Ver 6.3

NorCal Study Team proposed design differences include:

- Decreased the en route departure transitions from eight to five.
 - By moving the transition point closer to the runway, this resulted in earlier course divergence and greater capacity and efficiency.
- Different leg types were used by the Design Team than proposed by the Study Team.

Additional Design Considerations

Validation of the proposed design has been accomplished through Human-in-the-Loop (HITL) simulations.

The proposed changes do not require a spectrum analysis.

Implementation Dependencies

The SJC BMRNG RNAV is not dependent on any other proposed designs and can be submitted separately and as soon as practical for action/processing.

This proposed design requires amendments/modifications to:

- SJC, ZOA, and NCT Standard Operating Procedures (SOP).
- ZOA/NCT and NCT/SJC Letters of Agreement (LOA).
- Entry point amendment of two Q routes (128/130) in NCT/ZOA airspace.
- NCT West and 12-West Airspace.

No additional staffing, facilities or equipment is anticipated for this proposed design.

Attachments

Terminal Procedures:

- TARGETS Distribution Package.
- Flight Simulator Worksheet.
- RNAV Pro analysis results.
- HITL Documentation.

Northern California (NorCal) OAPM Design Package

SJC BMRNG RNAV DP (formerly SJC LOUPE SID and SJC DANVILLE SID)

NorCal SJC_BMRNG_DP_Ver 6.3

Review Signatures

The D&I Team reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Patricia Daniel, FAA Lead Northern California OAPM	Date	Steven Hefley, NATCA Lead Northern California OAPM	Date
---	------	---	------

John Fisher, Facility POC Oakland ARTCC	Date	Robert Newray, NATCA POC Oakland ARTCC	Date
--	------	---	------

Paul Pegadiotes, Facility POC Northern California TRACON	Date	Richard Hull, NATCA POC Northern California TRACON	Date
---	------	---	------

Corey McCauley, San Jose Tower Facility Lead	Date	Richard Burton, San Jose Tower NATCA Lead	Date
---	------	--	------

Northern California (NorCal) OAPM Design Package

SJC BRIXX STAR (formerly SFO GOLDN GATE STAR)

NorCal SJC_BRIXX_STAR_Ver 6.3 SJC_BRIXX_STAR_ver6.3

Name of Change	Date
SJC BRIXX STAR	12/21/2012
Change Classification	Current Phase of Design
Terminal Procedure STAR	<input type="checkbox"/> Preliminary Design (PD) <input type="checkbox"/> Operational Design (OD) <input type="checkbox"/> Operational Design Complete (ODC) <input checked="" type="checkbox"/> Proposed Final Design (PFD)
OAPM Study Team Reference(s)	Implementation Date
4.7.2.1	2014
Affected Facilities and Positions, Areas, and/or Sectors	Facility Points of Contact
Oakland ARTCC (ZOA): Sectors: 31-Red Bluff High 36-Mendocino High 41 Northern California TRACON (NCT): Sectors: Sutro Boulder Hooks Licke	ZOA: James Meadows 510-745-3469 Robert Newray 510-918-6859 NCT: Paul Pegadiotes 916-366-4048 Richard Hull 916-201-3206
Related/Dependent Submissions	Associated Data Files
NCT West and 12-West Airspace Change	Master Targets File

Purpose

The purpose of the proposed procedure is to enhance the current conventional SFO GOLDN GATE STAR (Figure 1) and address the following items identified by the NorCal OAPM Study and Design Teams:

- Flight Tracks do not follow published route.
- Lack of repeatable predictable flight paths.
- Optimization of lateral/vertical flight paths.
- Procedurally de-conflict from other area STARs.
- Efficient Cost to Carry (CTC) fuel planning.
- Use of Performance Based Navigation (PBN).

Northern California (NorCal) OAPM Design Package

SJC BRIXX STAR (formerly SFO GOLDN GATE STAR)

NorCal SJC_BRIXX_STAR_Ver 6.3 SJC_BRIXX_STAR_ver6.3

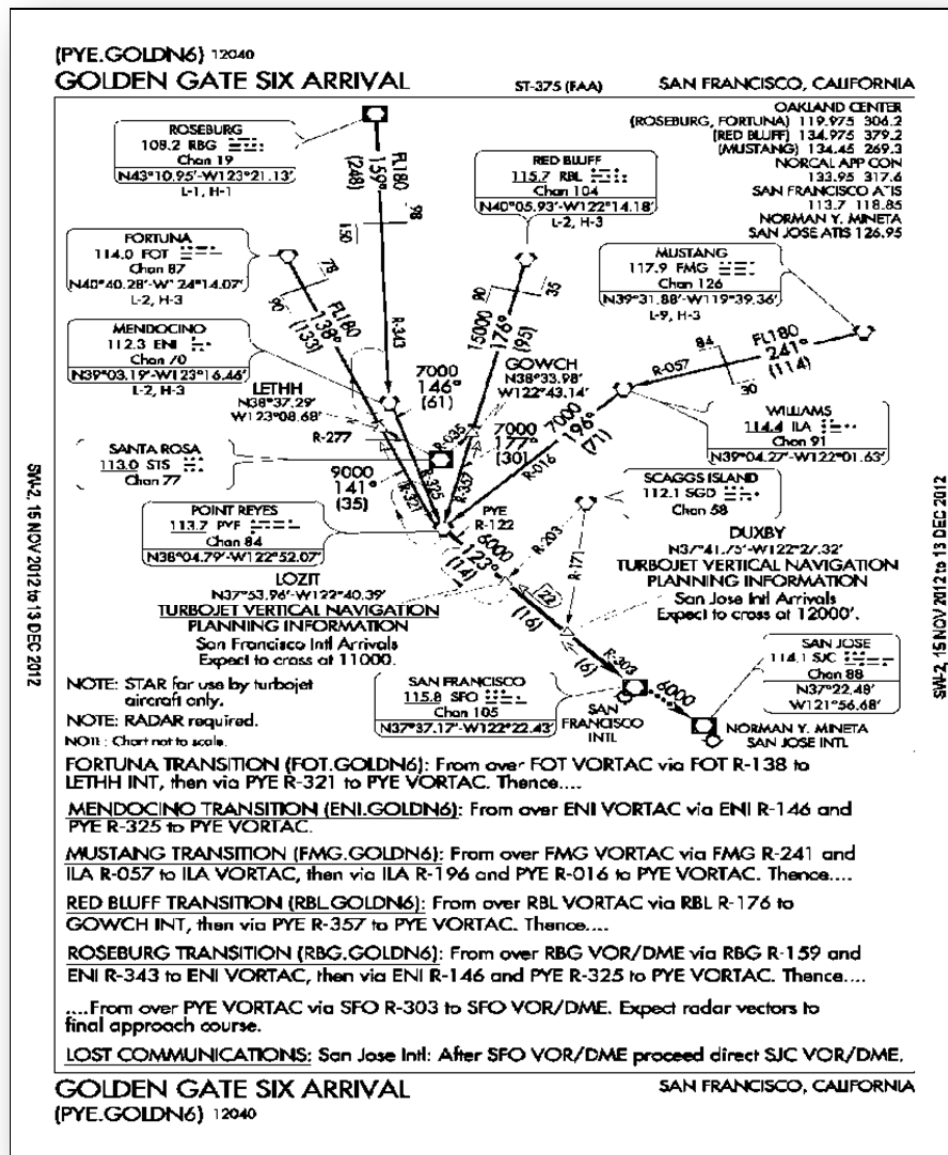


Figure 1: Current Procedure

Study Team Recommendation

The NorCal OAPM Study Team made the following recommendations:

- Create an RNAV STAR that is specific to SJC.
- Create an RNAV STAR that defines a predictable, repeatable path.

Northern California (NorCal) OAPM Design Package

SJC BRIXX STAR (formerly SFO GOLDN GATE STAR)

NorCal SJC_BRIXX_STAR_Ver 6.3 SJC_BRIXX_STAR_ver6.3

- Create an RNAV STAR that accommodates multiple approach transitions into SJC.
- Create an RNAV STAR that has OPD benefits.
- Create an RNAV STAR that aligns with current flight paths.
- Create an RNAV STAR that is procedurally de-conflicted from other proposed arrival and departure designs.

Figure 2 below shows the current published procedure (solid red) and the Study Team proposed routes (dashed blue), as well as current tracks (pink).

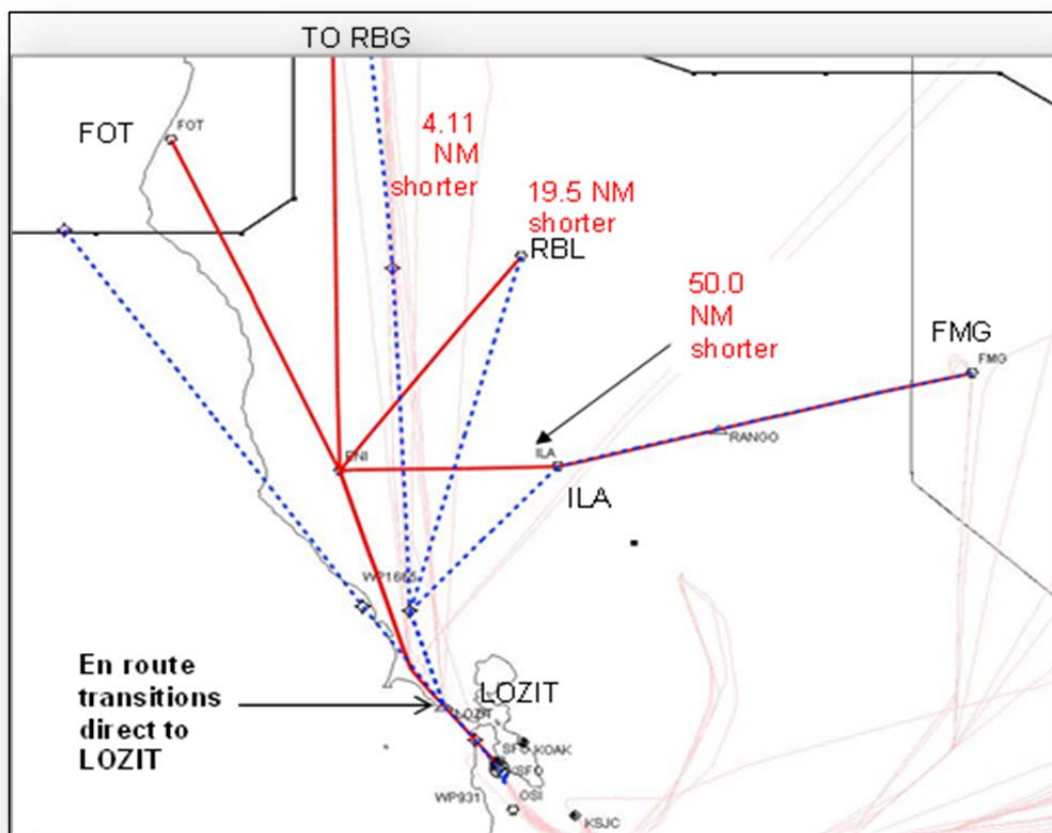


Figure 2: Study Team Recommendation

Proposed Final Design

Northern California (NorCal) OAPM Design Package

SJC BRIXX STAR (formerly SFO GOLDN GATE STAR)

NorCal SJC_BRIXX_STAR_Ver 6.3 SJC_BRIXX_STAR_ver6.3

The NorCal Design Team is proposing the creation of the new SJC BRIXX STAR. The GOLDN GATE STAR will continue to be used by aircraft unable to utilize Performance Based Navigation (PBN) procedures.

The new SJC BRIXX STAR is illustrated in Figure 3. Design enhancements and benefits include:

- The SJC BRIXX STAR is tied into the RNP to Runways 30 and 12.
- Procedural de-confliction from the SFO BDEGA STAR.
- Use of Performance Based Navigation (PBN).
- Optimization of lateral/vertical flight paths.
- Elimination of ground based Navaid dependency.
- Predictable and repeatable flight tracks.
- Reduction in controller workload and controller/pilot transmissions.
- Efficient Cost to Carry (CTC) fuel planning.

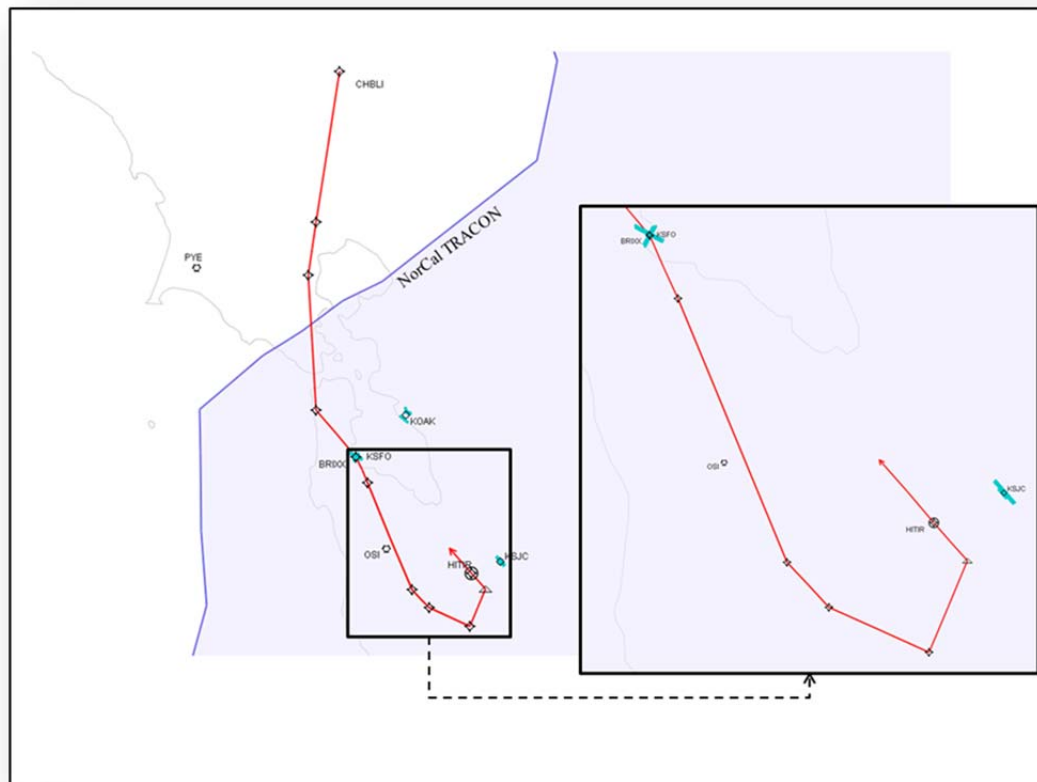


Figure 3: Proposed Procedure

Northern California (NorCal) OAPM Design Package

SJC BRIXX STAR (formerly SFO GOLDN GATE STAR)

NorCal SJC_BRIXX_STAR_Ver 6.3 SJC_BRIXX_STAR_ver6.3

The proposed SJC BRIXX STAR differs from the NorCal Study Team proposal by providing one transition (as opposed to four transitions) to provide procedural de-confliction from the SFO BDEGA STAR and the OAK WNDSR STAR. This reduces complexity due to overlapping lateral paths of the BDEGA and WNDSR procedures.

Additional Design Considerations

Validation of the proposed design has been accomplished through Human-in-the-Loop (HITL) simulations.

The proposed changes do not require a spectrum analysis.

Implementation Dependencies

The SJC BRIXX STAR was designed to be compatible with the SFO BDEGA STAR. It is not dependent on any other proposed designs and can be submitted separately and as soon as practical for action/processing.

This proposed design requires amendments/modifications to:

- ZOA and NCT Standard Operating Procedures (SOPs).
- ZOA, ZSE and NCT Letters of Agreement (LOA)
- Automation.
- NCT West and 12-West Airspace.

No additional staffing, facilities or equipment is anticipated for this proposed design.

Attachments

Terminal Procedures:

- TARGETS Distribution Package.
- Flight Simulator Worksheet.
- RNAV Pro analysis results.


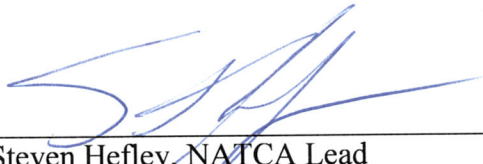
Northern California (NorCal) OAPM Design Package



SJC BRIXX STAR (formerly SFO GOLDN GATE STAR)



NorCal SJC BRIXX STAR Ver 6.3.docx SJC_BRIXX_STAR_ver6.3

Review Signatures

The D&I Team reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

	1-24-13		1/24/13
Patricia Daniel, FAA Lead Northern California OAPM	Date	Steven Hefley, NATCA Lead Northern California OAPM	Date

	1/24/13		1/24/13
John F. Fisher, Facility POC Oakland ARTCC	Date	Robert Newray, NATCA POC Oakland ARTCC	Date

	1/24/13		1/24/13
Paul Pegadiotes, Facility POC Northern California TRACON	Date	Richard Hull, NATCA POC Northern California TRACON	Date

Northern California (NorCal) OAPM Design Package

SJC FRLON STAR (formerly SJC BRINY STAR)

NorCal SJC_FRLON_STAR_Ver 6.3 SJC_FRLON_STAR_ver6.3

Name of Change	Date
SJC FRLON STAR	12/21/2012
Change Classification	Current Phase of Design
Terminal Procedure STAR	<input type="checkbox"/> Preliminary Design (PD) <input type="checkbox"/> Operational Design (OD) <input type="checkbox"/> Operational Design Complete (ODC) <input checked="" type="checkbox"/> Proposed Final Design (PFD)
OAPM Study Team Reference(s)	Implementation Date
NONE	2014
Affected Facilities and Positions, Areas, and/or Sectors	Facility Points of Contact
Oakland ARTCC (ZOA): Sectors: 31-Red Bluff High 36-Mendocino High 41 Northern California TRACON (NCT): Sectors: Boulder Sutro Licke Hooks	ZOA: James Meadows 510-745-3469 Robert Newray 510-918-6859 NCT: Paul Pegadiotes 916-366-4048 Richard Hull 916-201-3206
Related/Dependent Submissions	Associated Data Files
NCT East Plan Airspace Change	Master Targets File

Purpose

The purpose of the proposed procedure is to enhance the current conventional SJC BRINY STAR (Figure 1) and address the following items identified by the NorCal OAPM Design Team:

- Flight Tracks do not follow published route.
- Lack of repeatable predictable flight paths.
- Optimization of lateral/vertical flight paths.
- Procedurally de-conflict from other area STARs.
- Efficient Cost to Carry (CTC) fuel planning.
- Use of Performance Based Navigation (PBN).

Northern California (NorCal) OAPM Design Package

SJC FRLON STAR (formerly SJC BRINY STAR)

NorCal SJC_FRLON_STAR_Ver 6.3 SJC_FRLON_STAR_ver6.3

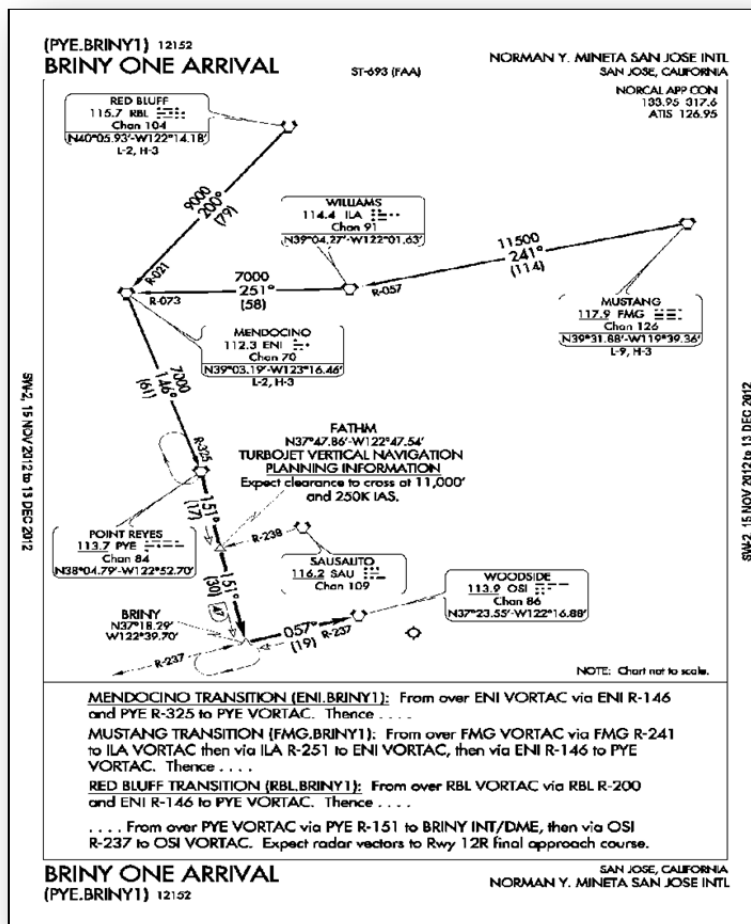


Figure 1: Current Procedure

Study Team Recommendation

The NorCal Study Team did not provide recommendation on this particular procedure, however after further analysis the NorCal Design Team proposed a new procedure to optimize and add efficiency to current operations.

Northern California (NorCal) OAPM Design Package

SJC FRLON STAR (formerly SJC BRINY STAR)

NorCal SJC_FRLON_STAR_Ver 6.3 SJC_FRLON_STAR_ver6.3

Proposed Final Design

The NorCal Design Team is proposing a new procedure named the SJC FRLON STAR. The current conventional SJC BRINY STAR will continue to be used by aircraft unable to utilize Performance Based Navigation (PBN) procedures.

The new SJC RNAV FRLON STAR is illustrated in Figure 2. Design enhancements and benefits include:

- Use of Performance Based Navigation (PBN).
- Optimization of lateral/vertical flight paths.
- Elimination of ground based Navaid dependency.
- Predictable and repeatable flight tracks.
- Reduction in controller workload and controller/pilot transmissions.
- Efficient Cost to Carry (CTC) fuel planning.

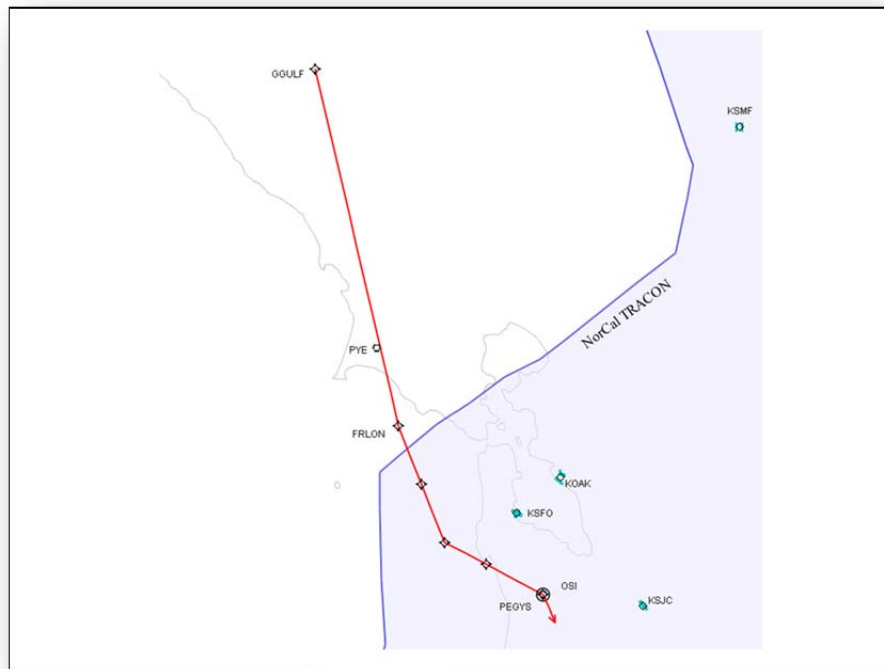


Figure 2: Proposed Procedure

Northern California (NorCal) OAPM Design Package

SJC FRLON STAR (formerly SJC BRINY STAR)

NorCal SJC_FRLON_STAR_Ver 6.3 SJC_FRLON_STAR_ver6.3

Additional Design Considerations

The proposed changes do not require a spectrum analysis.

Implementation Dependencies

The SJC FRLON STAR is not dependent on any other proposed designs and can be submitted separately as soon as practical for action/processing.

This proposed design requires amendments/modifications to:

- ZOA and NCT Standard Operating Procedures (SOP).
- ZOA, ZSE and NCT Letters of Agreement (LOA).
- Automation.
- NCT East Plan Airspace.

No additional staffing, facilities or equipment is anticipated for this proposed design.

Attachments

Terminal Procedures:

- TARGETS Distribution Package.
- Flight Simulator Worksheet.
- RNAV Pro analysis results.

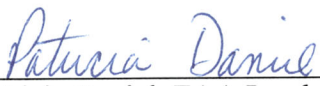

Northern California (NorCal) OAPM Design Package

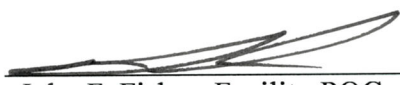

SJC FRLON STAR (formerly SJC BRINY STAR)



NorCal SJC FRLON STAR Ver 6.3.docx SJC_FRLON_STAR_ver6.3

Review Signatures

The D&I Team reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

	1-24-13		1/24/13
Patricia Daniel, FAA Lead Northern California OAPM	Date	Steven Hefley, NATCA Lead Northern California OAPM	Date

	1/24/13		1/24/13
John F. Fisher, Facility POC Oakland ARTCC	Date	Robert Newray, NATCA POC Oakland ARTCC	Date

	1/24/13		1/24/13
Paul Pegadiotes, Facility POC Northern California TRACON	Date	Richard Hull, NATCA POC Northern California TRACON	Date

Northern California (NorCal) OAPM Design Package

SJC SHVVR STAR (SJC EL NIDO STAR and SJC JAWWS STAR)

NorCal SJC_SHVVR_STAR_Ver6.3 Change SJC_SHVVR_STAR_ver6.3

OAPM Design Package Change Control Sheet			
Date	Description	FAA Co-Lead Initials	NATCA Co-Lead Initials
5/3/13	<p>The original SJC SHVVR STAR design is shown in Figure 1.</p> <p>The following changes were made in response to industry request and terrain issues and are shown in Figure 2.</p> <ol style="list-style-type: none"> 1. Amended the SHVVR STAR to reflect the new position of JJOBS. JJOBS needed to be moved slightly to accommodate the need for a 6000 MEA after JJOBS and to segregate the track between JJOBS and JESEN from precipitous terrain. 2. JJOBS AOA 70/250kts 3. Added EDMND, 55/230kts between JJOBS and JESEN to segregate terrain 4. New WP GAARY AOA 58 5. JESEN 40 6. ZORSA 30/210kts added after HITIR, followed by an FM Leg 7. Terminate segment at ZORSA 8. Deleted HITIR 40/210kts 		
	Latest File: Master Targets File		

Note: FAA and NATCA Metroplex Lead initials indicate that all required coordination (e.g. Environmental, Safety Management, Affected Facility POC, etc.) has been accomplished and all relevant data (e.g. TARGETS files) and attachments have been appropriately updated.

Northern California (NorCal) OAPM Design Package

SJC SHVVR STAR (SJC EL NIDO STAR and SJC JAWWS STAR)

NorCal SJC_SHVVR_STAR_Ver6.3 Change SJC_SHVVR_STAR_ver6.3

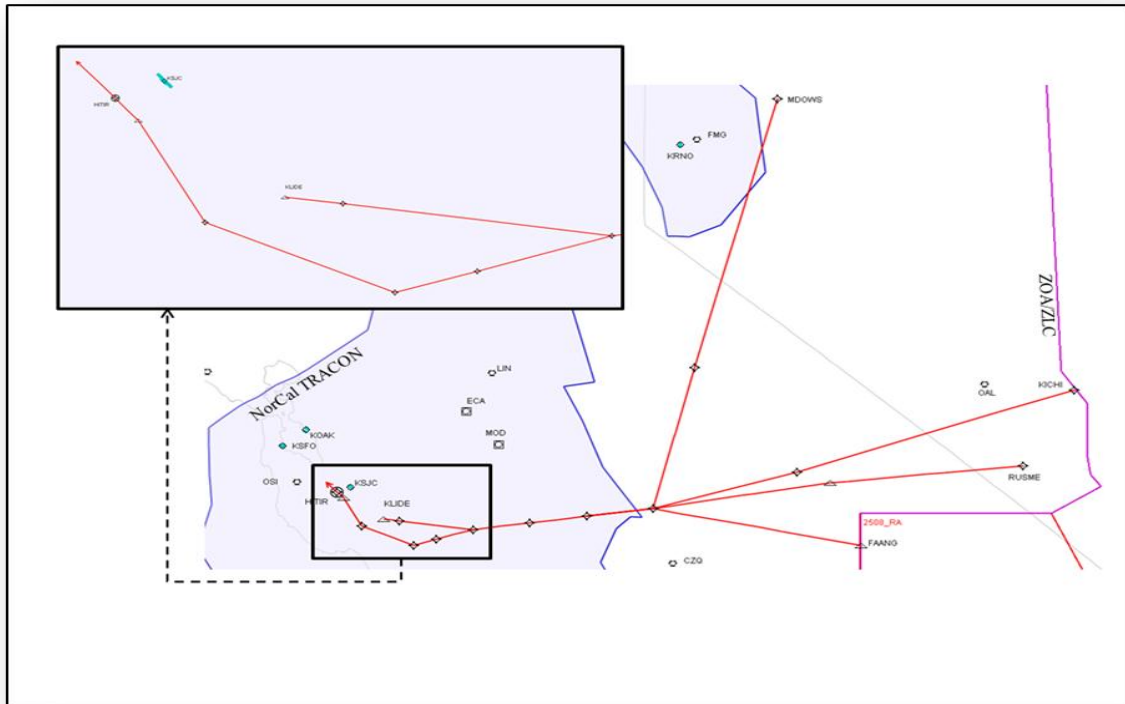


FIGURE 1. SJC SHVVR STAR PROPOSED DESIGN (Figure 3 in PFD)

Northern California (NorCal) OAPM Design Package

SJC SHVVR STAR (SJC EL NIDO STAR and SJC JAWWS STAR)

NorCal SJC_SHVVR_STAR_Ver6.3 Change SJC_SHVVR_STAR_ver6.3

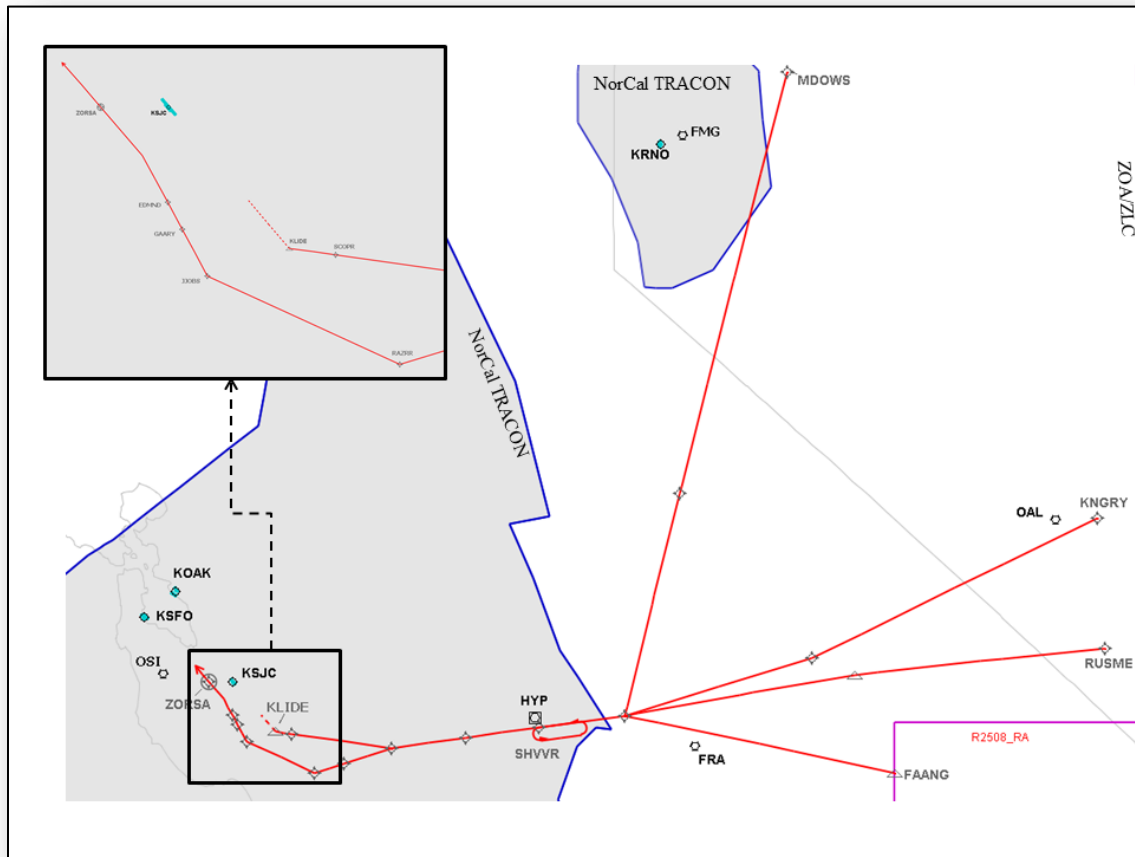


FIGURE 2. SJC SHVVR STAR PROPOSED DESIGN (Will replace Figure 3 of PFD)

Northern California (NorCal) OAPM Design Package

SJC SHVVR STAR (SJC EL NIDO STAR and SJC JAWWS STAR)

NorCal SJC_SHVVR_STAR_Ver 6.3 SJC_SHVVR_STAR_ver6.3

Name of Change	Date
SJC SHVVR STAR	12/21/2012
Change Classification	Current Phase of Design
Terminal Procedure STAR	<input type="checkbox"/> Preliminary Design (PD) <input type="checkbox"/> Operational Design (OD) <input type="checkbox"/> Operational Design Complete (ODC) <input checked="" type="checkbox"/> Proposed Final Design (PFD)
OAPM Study Team Reference(s)	Implementation Date
4.7.2.2 / 4.7.2.4	2014
Affected Facilities and Positions, Areas, and/or Sectors	Facility Points of Contact
Oakland ARTCC (ZOA): Sectors: 15-Clovis High 16 22 29-Linden High 32 33-Coaldale High 34-Modesto High 43-Mustang High 44 45 46 Northern California TRACON (NCT): Sectors: Turlock Morgan Licke Hooks	ZOA: James Meadows 510-745-3469 Robert Newray 510-918-6859 NCT: Paul Pegadiotes 916-366-4048 Richard Hull 916-201-3206
Related/Dependent Submissions	Associated Data Files
NCT West, East and 12-West Plan Airspace Changes ZOA Airspace Change Sectors: 11, 22	Master Targets File

Northern California (NorCal) OAPM Design Package

SJC SHVVR STAR (SJC EL NIDO STAR and SJC JAWWS STAR)

NorCal SJC_SHVVR_STAR_Ver 6.3 SJC_SHVVR_STAR_ver6.3

Purpose

The purpose of the proposed procedure is to enhance the current conventional SJC EL NIDO and SJC JAWWS STARs (Figure 1) and address the following items identified by the NorCal OAPM Study and Design Teams:

- Flight Tracks do not follow published route.
- Lack of repeatable predictable flight paths.
- Optimization of lateral/vertical flight paths.
- Procedurally de-conflict from other area STARs.
- Efficient Cost to Carry (CTC) fuel planning.
- Use of Performance Based Navigation (PBN).

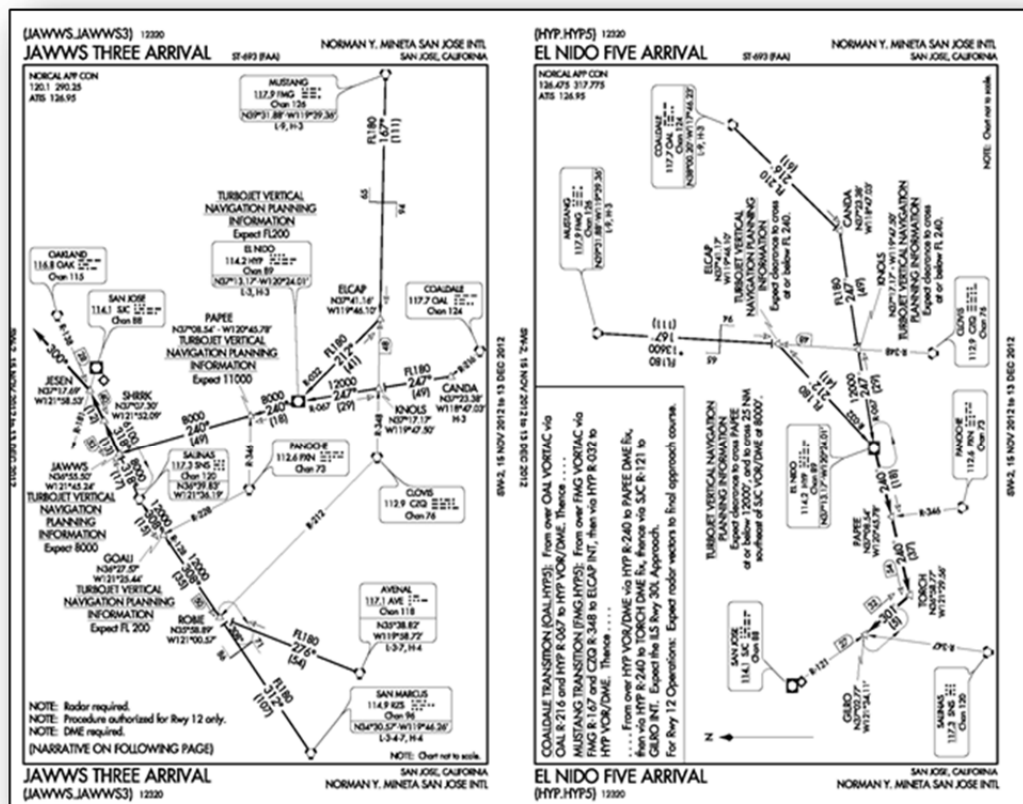


Figure 1: Current Procedures

Northern California (NorCal) OAPM Design Package

SJC SHVVR STAR (SJC EL NIDO STAR and SJC JAWWS STAR)

NorCal SJC_SHVVR_STAR_Ver 6.3 SJC_SHVVR_STAR_ver6.3

Study Team Recommendation

The NorCal OAPM Study Team made the following recommendations to address the issues listed above:

- Create an RNAV STAR that defines a predictable, repeatable path.
- Create an RNAV STAR that is procedurally de-conflicted from other procedures.
- Create an RNAV STAR that has OPD benefits.
- Create an RNAV STAR that aligns with current flight paths.
- Create an RNAV STAR that offers multiple approach transitions.

Figure 2 illustrates the published procedure (solid red) and the Study Team recommended routes (dashed blue), as well as current tracks (light orange).

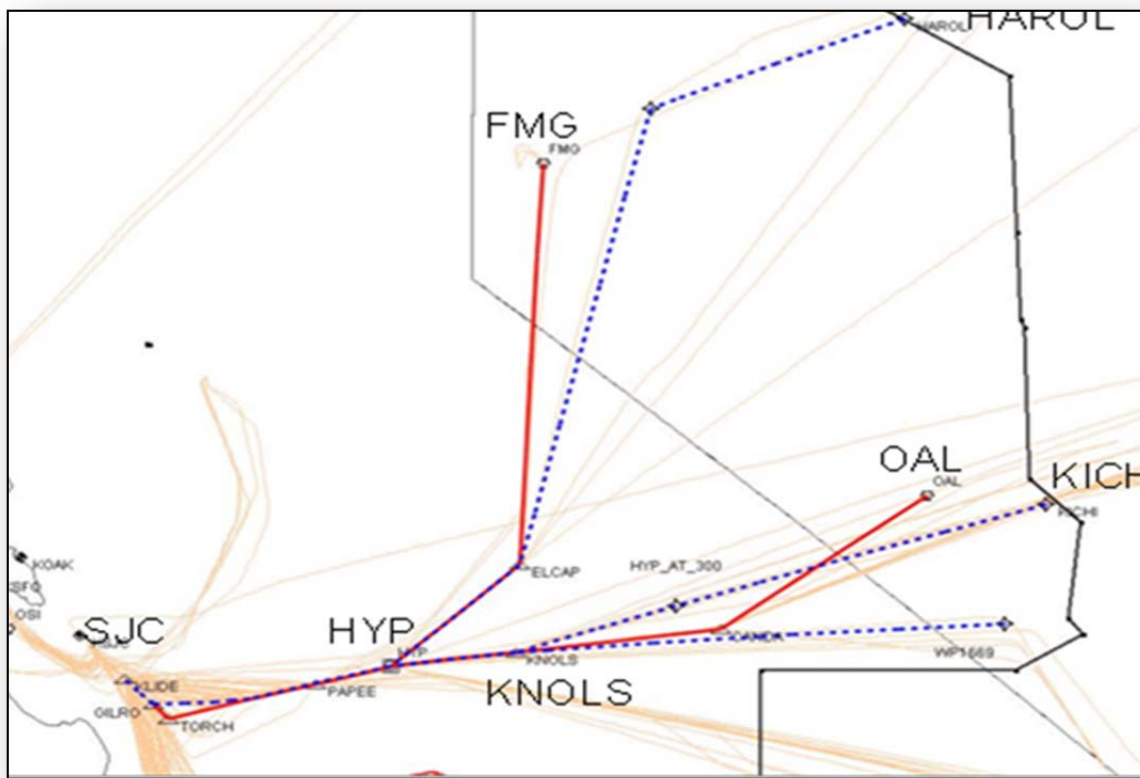


Figure 2: Study Team Recommendation

Northern California (NorCal) OAPM Design Package

SJC SHVVR STAR (SJC EL NIDO STAR and SJC JAWWS STAR)

NorCal SJC_SHVVR_STAR_Ver 6.3 SJC_SHVVR_STAR_ver6.3

Proposed Final Design

The NorCal Design Team is proposing a new procedure named the SJC SHVVR STAR. The new design will combine the current conventional SJC EL NIDO and east transitions from the SJC JAWWS STARS. These conventional STARS will continue to be used by aircraft unable to utilize Performance Based Navigation (PBN) procedures.

The new SJC SHVVR STAR is illustrated in Figure 3. Design enhancements and benefits include:

- Use of Performance Based Navigation (PBN).
- Optimization of lateral/vertical flight paths.
- Elimination of ground based Navaid dependency.
- Predictable and repeatable flight tracks.
- Reduction in controller workload and controller/pilot transmissions.
- Efficient Cost to Carry (CTC) fuel planning.
- Unused OAL and FMG transitions are eliminated.
- Tie in with current RNP approach procedures.
- Single STAR to accommodate either SJC Runway 30 or 12 configurations.
- Procedural de-confliction from the SJC TECKY DP Runway 12 departures.
- Procedural de-confliction from the OAK EMZOH STAR and SMF SUTTR STAR.

NorCal SJC_SHVVR_STAR_Ver 6.3 SJC_SHVVR_STAR_ver6.3



The proposed SJC SHVVR STAR design differences include:

- Adding multiple runway transitions to the STAR design which will enable a single STAR to be used for either West Plan or East Plan operations at SJC.
- The design incorporates the east arrival flow of the published SJC JAWWS STAR (See Figure 2) for Runway 12 configuration while the remainder of the SJC JAWWS STAR (south arrival flow) is addressed in the new proposed SJC SILCN STAR.
- The lateral track of the SJC SHVVR STAR is shorter than the current conventional HYP/JAWWS STARs and the Study Team recommended STAR.

Additional Design Considerations

Validation of the proposed design has been accomplished through Human-in-the-Loop (HITL) simulations.

The proposed changes will not require a spectrum analysis for ZOA airspace changes.

Northern California (NorCal) OAPM Design Package

SJC SHVVR STAR (SJC EL NIDO STAR and SJC JAWWS STAR)

NorCal SJC_SHVVR_STAR_Ver 6.3 SJC_SHVVR_STAR_ver6.3

Implementation Dependencies

The SJC SHVVR STAR is not dependent on any other proposed designs and can be submitted separately and as soon as practical for action/processing,

This proposed design requires amendments/modifications to:

- ZOA and NCT Standard Operating Procedures (SOP).
- ZOA/ZLA, ZOA/ZLC, ZOA/ E10, and the ZOA/NCT Letters of Agreement (LOA).
- NCT West, East and 12-West Plan Airspace.

No additional staffing, facilities or equipment is anticipated for this proposed design.

Attachments

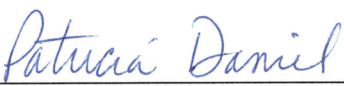
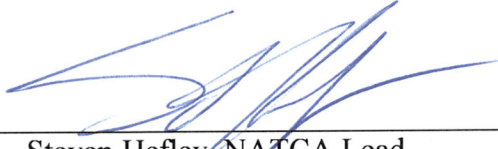
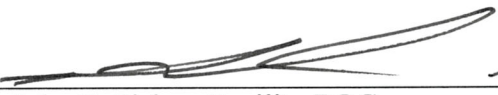

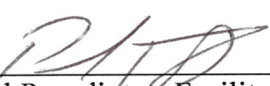

Terminal Procedures:

- TARGETS Distribution Package.
- Flight Simulator Worksheet.
- RNAV Pro analysis results.

Northern California (NorCal) OAPM Design Package
SJC SHVVR STAR (SJC EL NIDO STAR and SJC JAWWS STAR)
NorCal SJC SHVVR STAR Ver 6.3.docx SJC_SHVVR_STAR_ver6.3

Review Signatures

The D&I Team reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

 Patricia Daniel, FAA Lead Northern California OAPM	1-24-13 Date	 Steven Hefley, NATCA Lead Northern California OAPM	1/24/13 Date
 John F. Fisher, Facility POC Oakland ARTCC	1/24/13 Date	 Robert Newray, NATCA POC Oakland ARTCC	1/24/13 Date
 Paul Pegadiotes, Facility POC Northern California TRACON	1/24/13 Date	 Richard Hull, NATCA POC Northern California TRACON	1/24/13 Date

Northern California (NorCal) OAPM Design Package

SJC SILCN STAR (formerly SJC ROBIE STAR and SJC JAWWS STAR)

NorCal SJC_SILCN_STAR_Ver 6.3 SJC_SILCN_STAR_ver6.3

Name of Change	Date
SJC SILCN STAR	12/21/2012
Change Classification	Current Phase of Design
Terminal Procedure STAR	<input type="checkbox"/> Preliminary Design (PD) <input type="checkbox"/> Operational Design (OD) <input type="checkbox"/> Operational Design Complete (ODC) <input checked="" type="checkbox"/> Proposed Final Design (PFD)
OAPM Study Team Reference(s)	Implementation Date
4.7.2.3 / 4.7.2.4	2014
Affected Facilities and Positions, Areas, and/or Sectors	Facility Points of Contact
Oakland ARTCC (ZOA): Sectors: 11 13-Panoche High 14-Big Sur High Northern California TRACON (NCT): Sectors: Licke Morgan Hooks	ZOA: James Meadows 510-745-3469 Robert Newray 510-918-6859 NCT: Paul Pegadiotes 916-366-4048 Richard Hull 916-201-3206
Related/Dependent Submissions	Associated Data Files
ZOA Airspace Change: create and delegate a Shelf 150B190 between sector 10 and NCT NCT 12-West, West and East Plan Airspace Change	Master Targets File

Purpose

The purpose of the proposed procedure is to enhance the current conventional SJC ROBIE and SJC JAWWS STARs (Figure 1) and address the following items identified by the NorCal OAPM Study and Design Teams:

- Flight Tracks do not follow published route.

Northern California (NorCal) OAPM Design Package

SJC SILCN STAR (formerly SJC ROBIE STAR and SJC JAWWS STAR)

NorCal SJC_SILCN_STAR_Ver 6.3 SJC_SILCN_STAR_ver6.3

- Lack of repeatable predictable flight paths.
- Optimization of lateral/vertical flight paths.
- Procedurally de-conflict from other area STARs.
- Efficient Cost to Carry (CTC) fuel planning.
- Use of Performance Based Navigation (PBN).

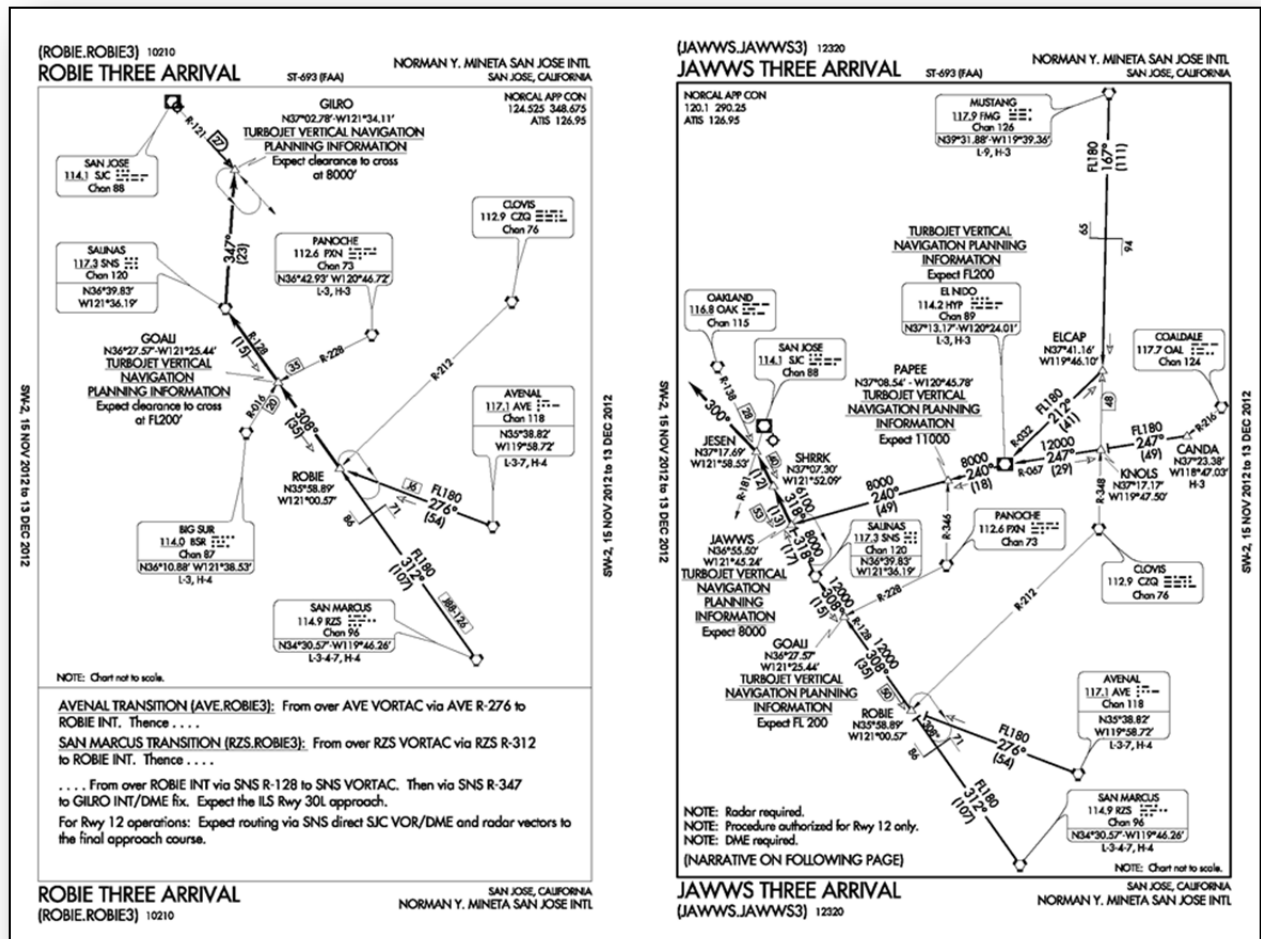


Figure 1: Current Procedures

Study Team Recommendation

The NorCal OAPM Study Team made the following recommendations:

- Create an RNAV STAR that defines a predictable, repeatable path.

Northern California (NorCal) OAPM Design Package

SJC SILCN STAR (formerly SJC ROBIE STAR and SJC JAWWS STAR)

NorCal SJC_SILCN_STAR_Ver 6.3 SJC_SILCN_STAR_ver6.3

- Create an RNAV STAR that is procedurally de-conflicted from other procedures.
- Create an RNAV STAR that has OPD benefits.
- Create an RNAV STAR that aligns with current flight paths.
- Create an RNAV STAR that offers multiple approach transitions.

Figure 2 illustrates the published procedure (solid red) and the proposed routes (dashed blue), as well as current tracks (light orange).

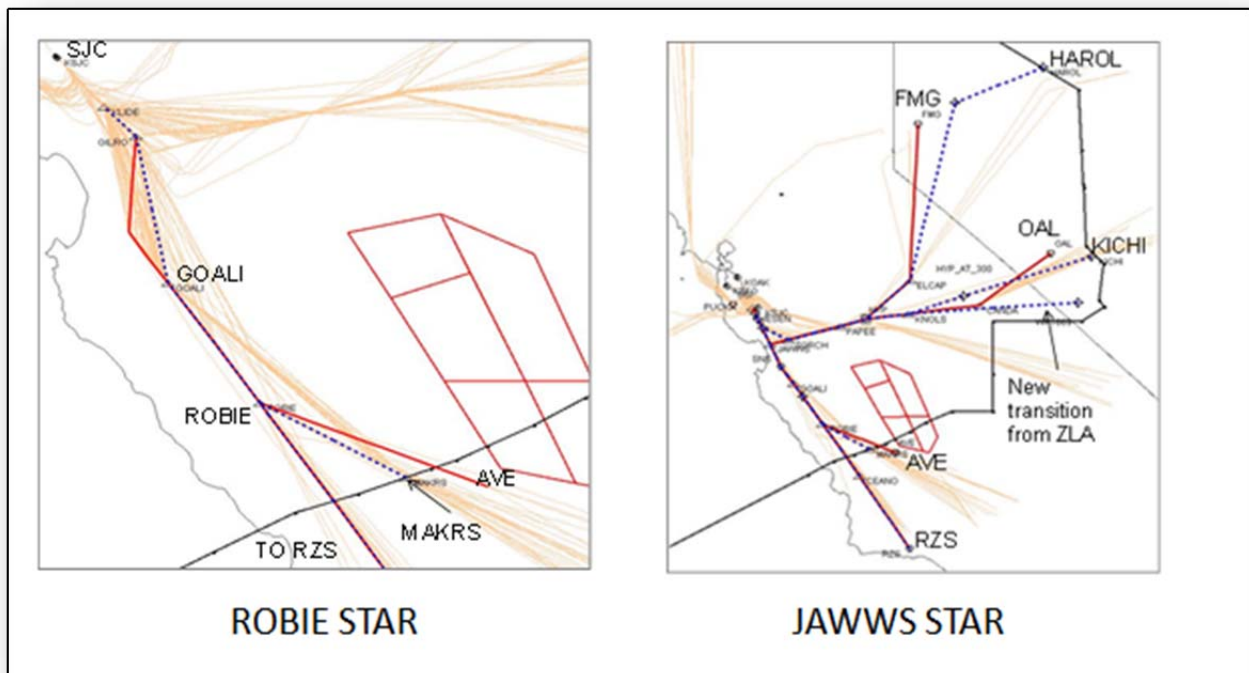


Figure 2: Study Team Recommendations

Proposed Final Design

The NorCal Design Team is proposing a new procedure named the SJC SILCN STAR. The new design will combine the current conventional SJC ROBIE STAR and the south arrival flow from the SJC JAWWS STAR. These conventional STARS will continue to be used by aircraft unable to utilize Performance Based Navigation (PBN) procedures.

The new SJC SILCN STAR is illustrated in Figure 3. Design enhancements and benefits include:

Northern California (NorCal) OAPM Design Package

SJC SILCN STAR (formerly SJC ROBIE STAR and SJC JAWWS STAR)

NorCal SJC_SILCN_STAR_Ver 6.3 SJC_SILCN_STAR_ver6.3

- Use of Performance Based Navigation (PBN).
- Optimization of lateral/vertical flight paths.
- Elimination of ground based Navaid dependency.
- Predictable and repeatable flight tracks.
- Reduction in controller workload and controller/pilot transmissions.
- Efficient Cost to Carry (CTC) fuel planning.
- Single STAR to accommodate either SJC Runway 30 or 12 configurations.

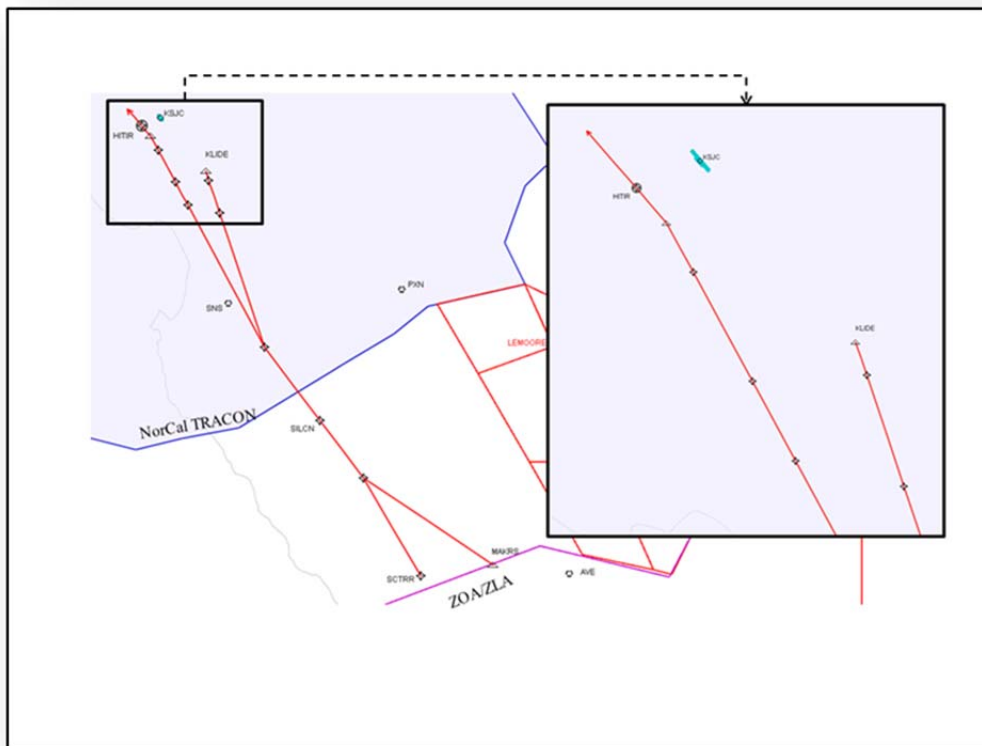


Figure 3: Proposed Procedure

The Design Team changed the Study Team recommendation by:

- Provided additional multiple runway transitions which enable a single STAR to be used for either SJC West or East Plan Configurations.
 - VLLEY to HITIR landing Runway 12.
 - VLLEY to KLIDE landing Runway 30.
- Eliminated the Avenal (AVE) and San Marcos (RZS) transitions

Northern California (NorCal) OAPM Design Package

SJC SILCN STAR (formerly SJC ROBIE STAR and SJC JAWWS STAR)

NorCal SJC_SILCN_STAR_Ver 6.3 SJC_SILCN_STAR_ver6.3

- Revised the transition fixes to CEANO and MAKRS.
- Incorporated only the South arrival flow¹ of the published JAWWS STAR For Runway 12 configuration.
- Shortened the lateral tracks of the current conventional SJC ROBIE and SJC JAWWS STARs, as well as the NorCal Study Team recommended routing.
- Procedurally de-conflicted from proposed Bay area departure routes.

Additional Design Considerations

Validation of the proposed design has been accomplished through Human-in-the-Loop (HITL) simulations.

The proposed will not require a spectrum analysis.

Implementation Dependencies

The SJC SILCN STAR is not dependent on any other proposed designs and can be submitted separately and as soon as practical for action/processing,

This proposed design requires amendments/modifications to:

- NCT 12-West, West and East Plan Airspace.
- ZOA Sector 10 Airspace change.
- ZOA and NCT Standard Operating Procedures (SOP).
- ZOA/ZLA and ZOA/NCT Letters of Agreement (LOA).

No additional staffing, facilities or equipment is anticipated for this proposed design.

Attachments

Terminal Procedures:

- TARGETS Distribution Package.
- Flight Simulator Worksheet.
- RNAV Pro analysis results.

¹ The east arrival flow for the JAWWS STAR is addressed in the new proposed SJC SHVVR STAR.

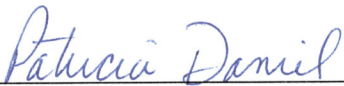
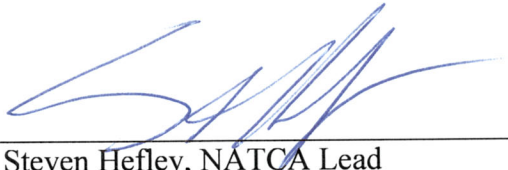

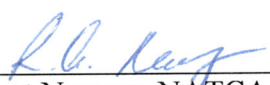


Northern California (NorCal) OAPM Design Package

SJC SILCN STAR (formerly SJC ROBIE STAR and SJC JAWWS STAR)

NorCal SJC SILCN STAR Ver 6.3.docx SJC_SILCN_STAR_ver6.3

Review Signatures

The D&I Team reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

 Patricia Daniel, FAA Lead Northern California OAPM	1-24-13 Date	 Steven Hefley, NATCA Lead Northern California OAPM	1/24/13 Date
 John F. Fisher, Facility POC Oakland ARTCC	1/24/13 Date	 Robert Newray, NATCA POC Oakland ARTCC	1/24/13 Date
 Paul Pegadiotes, Facility POC Northern California TRACON	1/24/13 Date	 Richard Hull, NATCA POC Northern California TRACON	1/24/13 Date

Northern California (NorCal) OAPM Design Package

SJC TECKY RNAV DP (formerly SJC SJC9 SID and SJC MOONY3 SID)

NorCal SJC_TECKY_DP_Ver 6.3 SJC_TECKY_DP_ver6.3

Name of Change	Date
SJC TECKY RNAV DP	12/21/2012
Change Classification	Current Phase of Design
Terminal Procedure DP	<input type="checkbox"/> Preliminary Design (PD) <input type="checkbox"/> Operational Design (OD) <input type="checkbox"/> Operational Design Complete (ODC) <input checked="" type="checkbox"/> Proposed Final Design (PFD)
OAPM Study Team Reference(s)	Implementation Date
4.3.2.1	2014
Affected Facilities and Positions, Areas, and/or Sectors	Facility Points of Contact
Oakland ARTCC (ZOA): Sectors: 11 13-Panoche High 14-Big Sur High 15-Clovis High 16 22 35 Northern California TRACON (NCT): Sectors: Toga Morgan San Jose Tower (SJC)	ZOA: James Meadows 510-745-3469 Robert Newray 510-918-6859 NCT: Paul Pegadiotes 916-366-4048 Richard Hull 916-201-3206 SJC: Corey McCauley 408-982-0750 Richard Burton 408-857-3544
Related/Dependent Submissions	Associated Data Files
NCT West, East, and 12-West Plan Airspace Changes	Master Targets File

Purpose

The purpose of the proposed procedure is to enhance the current conventional SJC SJC9 and SJC MOONY SIDs (Figure 1) and address the following items identified by the NorCal OAPM Study and Design Teams for SJC departures:

- Flight Tracks do not follow published route.
- Lack of repeatable predictable flight paths.

NorCal SJC_TECKY_DP_Ver 6.3 SJC_TECKY_DP_ver6.3

- Efficient Cost to Carry (CTC) fuel planning.
- Optimization of lateral/vertical flight paths.
- Use of Performance Based Navigation (PBN).

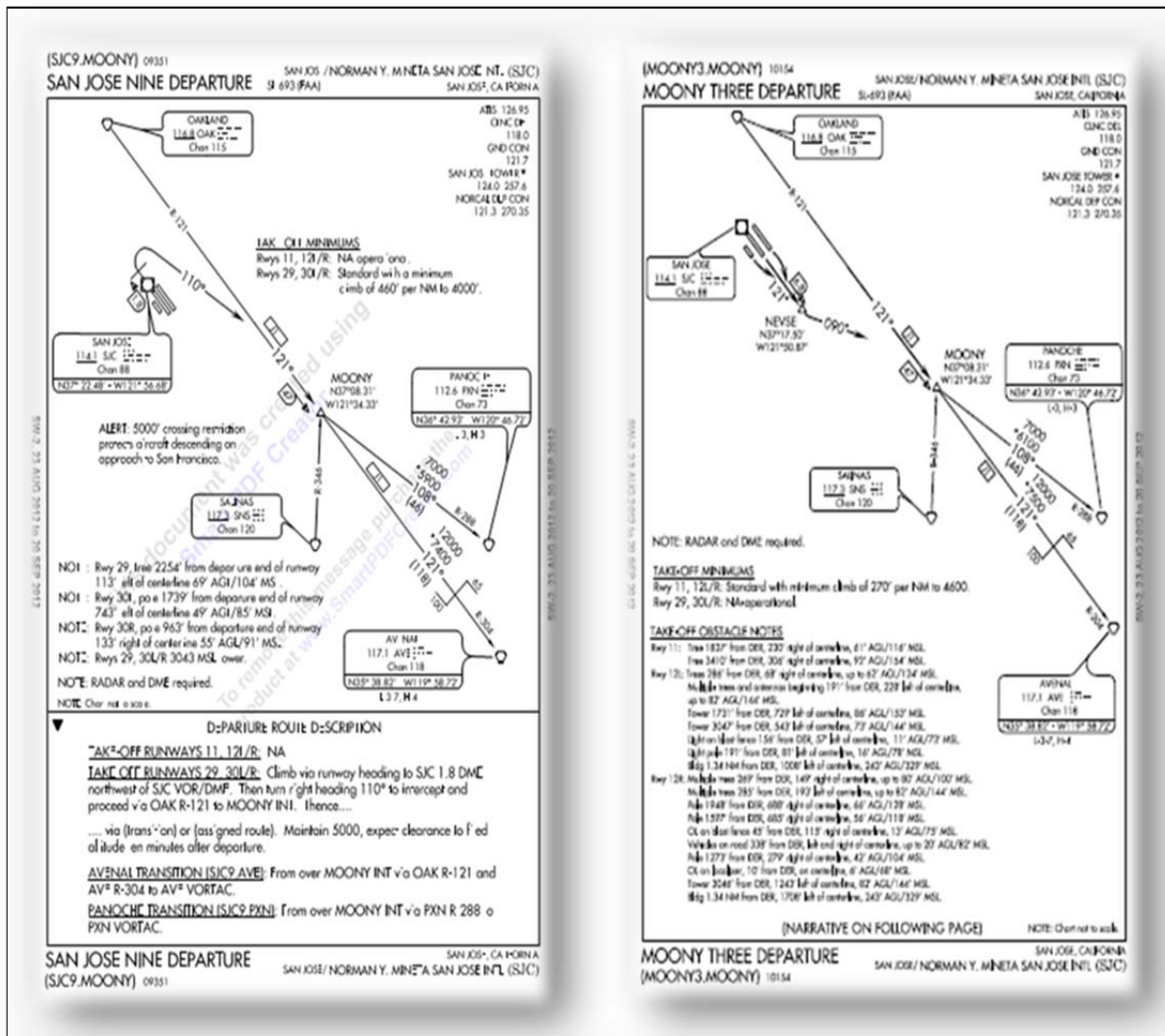


Figure 1: Current Procedures

Northern California (NorCal) OAPM Design Package

SJC TECKY RNAV DP (formerly SJC SJC9 SID and SJC MOONY3 SID)

NorCal SJC_TECKY_DP_Ver 6.3 SJC_TECKY_DP_ver6.3

Study Team Recommendation

The NorCal OAPM Study Team made the following recommendations for the improved redesign of SJC departures to the south and southeast:

- New RNAV procedure de-conflicted from other Bay Area procedures.
- Align with current traffic flows.
- Provide a predictable, repeatable path.
- En route departure transitions increased/optimized.

Figure 2 illustrates the published procedure (solid purple) and the proposed routes (dashed blue), as well as current tracks (teal).

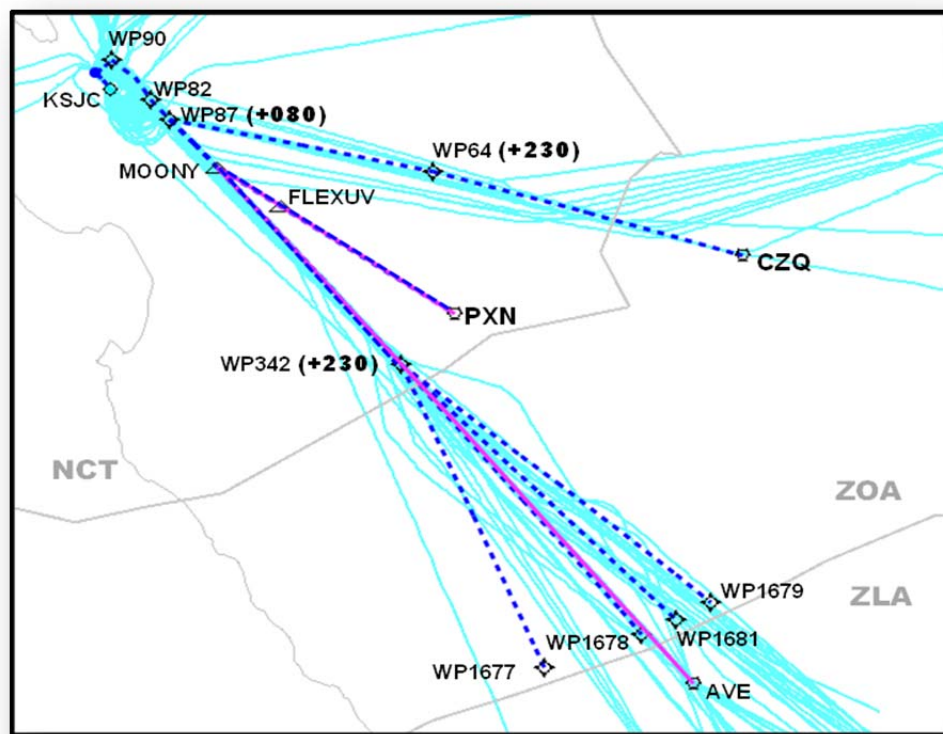


Figure 2: Study Team Recommendation

Northern California (NorCal) OAPM Design Package

SJC TECKY RNAV DP (formerly SJC SJC9 SID and SJC MOONY3 SID)

NorCal SJC_TECKY_DP_Ver 6.3 SJC_TECKY_DP_ver6.3

Proposed Final Design

The NorCal Design Team is proposing the creation of the new SJC TECKY RNAV DP. The new design will combine the SJC SJC9 SID and SJC MOONY3 SID into a single new RNAV procedure. The SJC SJC9 and SJC MOONY3 conventional procedures will continue to be used by aircraft unable to utilize Performance Based Navigation (PBN) procedures.

The new SJC TECKY RNAV DP is illustrated in Figure 3. The design elements and benefits include:

- Use of Performance Based Navigation (PBN).
- Optimization of lateral flight paths.
- Elimination of ground based Navaid dependency.
- Predictable and repeatable flight tracks.
- Reduction in controller workload and controller/pilot transmissions.
- Efficient Cost to Carry (CTC) fuel planning.
- Procedurally de-conflicted from other area procedures and Special Activity Airspace (SAA).
- Combines the current SJC SJC9 SID and SJC MOONY3 SID into a single RNAV procedure.
- Three (3) transitions are designed for Runway 30 traffic flows:
 - 1) CISKO transition follows tracks to the Los Angeles Basin over FLW.
 - 2) EBAY transition mirrors the old AVE transition.
 - 3) The GYRLS, LOSHN (BOILE), RGOOD (PMD) transitions, are only authorized for aircraft operating above FL280 due to the Lemoore SAA.
- Two (2) transitions are designed for Runway 12 traffic flows:
 - 1) CISKO transition follows tracks to the Los Angeles Basin over FLW.
 - 2) EBAY transition mirrors the MOONY/AVE transition.
- Routes are designed to maximize efficiencies utilizing expanded terminal to en route transitional separation (3 NM increasing to 5 NM).

Northern California (NorCal) OAPM Design Package

SJC TECKY RNAV DP (formerly SJC SJC9 SID and SJC MOONY3 SID)

NorCal SJC_TECKY_DP_Ver 6.3 SJC_TECKY_DP_ver6.3

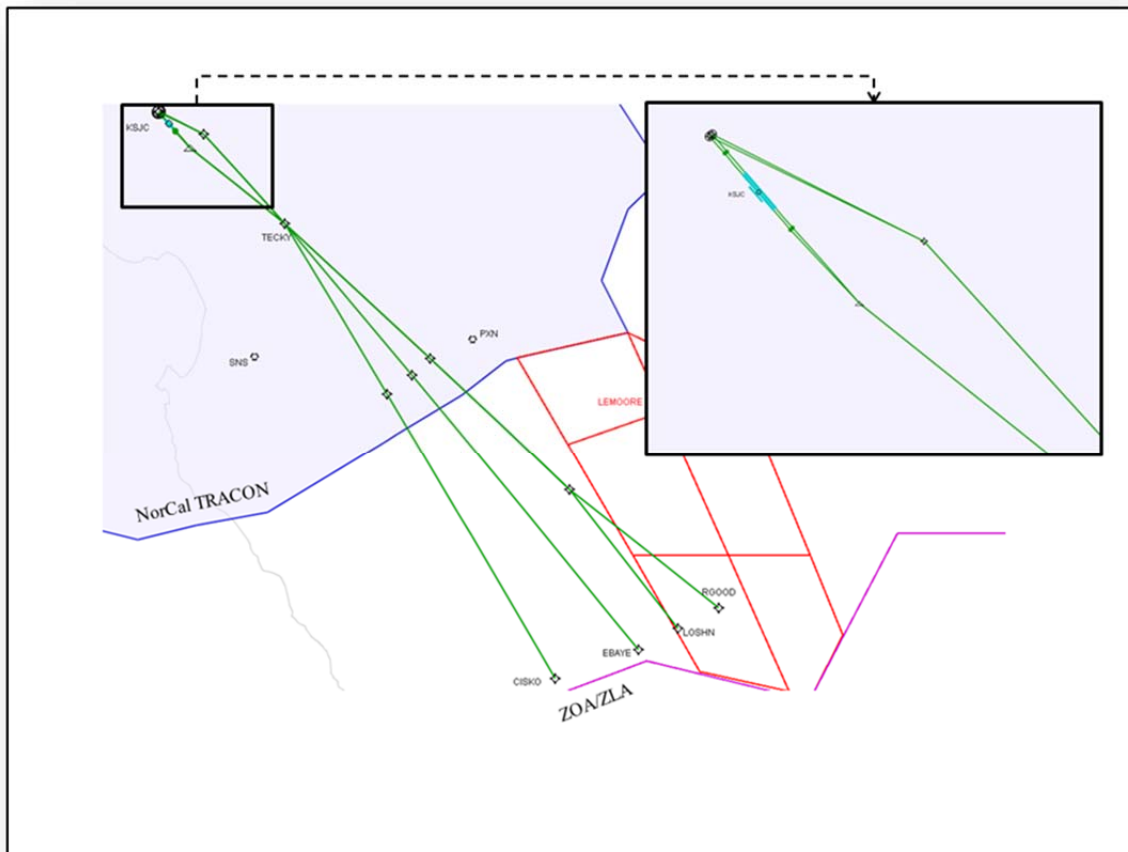


Figure 3: Proposed Procedure

The proposed SJC TECKY RNAV DP design differences include:

- Combining the SJC SJC9 and MOONY3 procedures
- Adding multiple runway transitions which will enable a single procedure to be used for either SJC West or East Plan operations.
- The Study team proposal of traffic flow over CZQ was not followed due to a confliction with the new OAK EMZOH arrival procedure.

Northern California (NorCal) OAPM Design Package

SJC TECKY RNAV DP (formerly SJC SJC9 SID and SJC MOONY3 SID)

NorCal SJC_TECKY_DP_Ver 6.3 SJC_TECKY_DP_ver6.3

Additional Design Considerations

Validation of the proposed design has been accomplished through Human-in-the-Loop (HITL) simulations.

The proposed changes do not require a spectrum analysis.

Implementation Dependencies

The SJC TECKY RNAV DP is not dependent on any other proposed designs and can be submitted separately and as soon as practical for action/processing.

This proposed design requires amendments/modifications to:

- ZOA, SJC and NCT Standard Operating Procedures (SOP).
- ZOA/ZOA, ZOA/NCT, and NCT/SJC Letters of Agreement (LOA).
- Automation.
- NCT West, East, and 12-West Plan Airspace.

No additional staffing, facilities or equipment is anticipated for this proposed design.

Attachments

Terminal Procedures:

- TARGETS Distribution Package.
- Flight Simulator Worksheet.
- RNAV Pro analysis results.

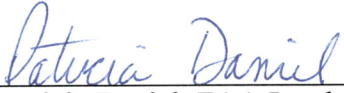


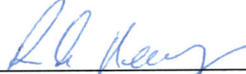

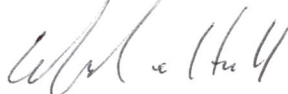

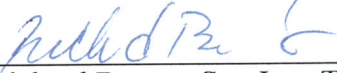
Northern California (NorCal) OAPM Design Package

SJC TECKY RNAV DP (formerly SJC SJC9 SID and SJC MOONY3 SID)

NorCal SJC TECKY DP Ver 6.3.docx SJC_TECKY_DP_ver6.3

Review Signatures

The D&I Team reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

 Patricia Daniel, FAA Lead Northern California OAPM	1-24-13 Date	 Steven Hefley, NATCA Lead Northern California OAPM	1/24/13 Date
 John F. Fisher, Facility POC Oakland ARTCC	1/24/13 Date	 Robert Newray, NATCA POC Oakland ARTCC	1/24/13 Date
 Paul Pegadiotes, Facility POC Northern California TRACON	1/24/13 Date	 Richard Hull, NATCA POC Northern California TRACON	1/24/13 Date
 Corey McCauley, San Jose Tower Facility Lead	1/17/2013 Date	 Richard Burton, San Jose Tower NATCA Lead	1/17/2013 Date

Northern California (NorCal) OAPM Design Package

SMF FTHIL RNAV DP (formerly SMF FROGO SID)

NorCal SMF_FTHIL_RNAV_DP_Ver6.3 Change.docx SMF_FTHIL_DP_ver6.3

OAPM Design Package Change Control Sheet			
Date	Description	FAA Co-Lead Initials	NATCA Co-Lead Initials
5/7/13	<p>The original GRDOE RNAV DP procedure design is shown in Figure 1.</p> <p>The following changes were made to accommodate industry requests and are shown in Figure 2.</p> <ol style="list-style-type: none">1. GRDOE RNAV DP has been renamed the FTHIL RNAV DP2. FTHIL WP added prior to the GRDOE WP3. Runway transitions terminated at FTHIL		
	Latest File: Master Targets File		

Note: FAA and NATCA Metroplex Lead initials indicate that all required coordination (e.g. Environmental, Safety Management, Affected Facility POC, etc.) has been accomplished and all relevant data (e.g. TARGETS files) and attachments have been appropriately updated.

Northern California (NorCal) OAPM Design Package

SMF FTHIL RNAV DP (formerly SMF FROGO SID)

NorCal SMF_FTHIL_RNAV_DP_Ver6.3 Change.docx SMF_FTHIL_DP_ver6.3

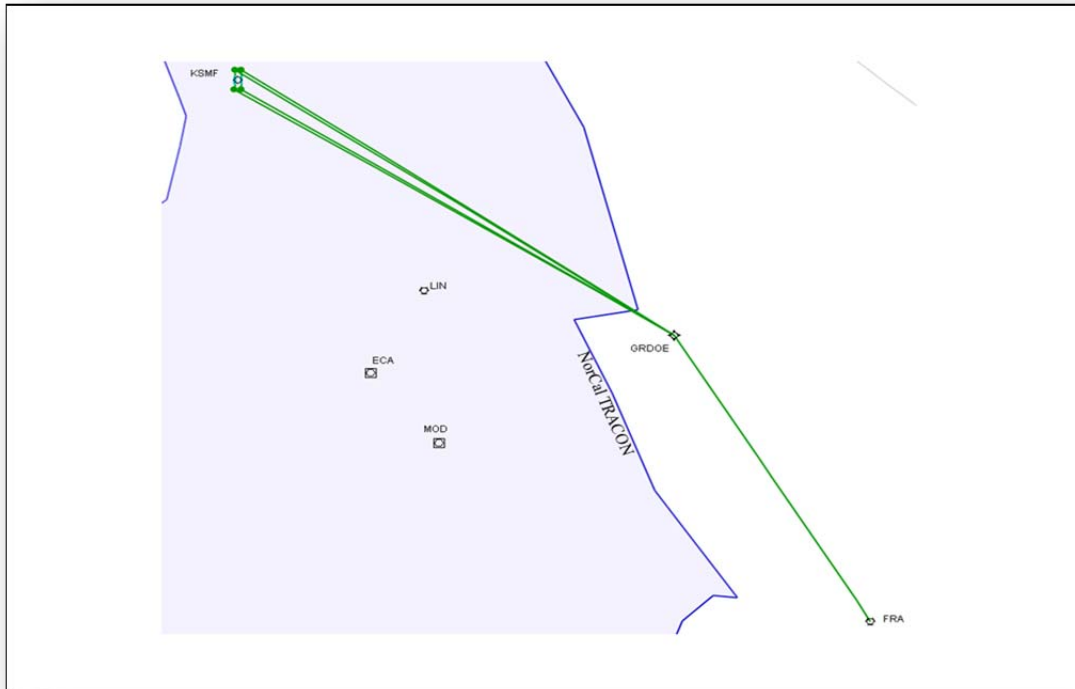


FIGURE 1. SMF GRDOE RNAV DP PROPOSED DESIGN (Figure 3 in PFD)

Northern California (NorCal) OAPM Design Package

SMF FTHIL RNAV DP (formerly SMF FROGO SID)

NorCal SMF FTHIL RNAV DP Ver6.3 Change.docx SMF FTHIL DP ver6.3

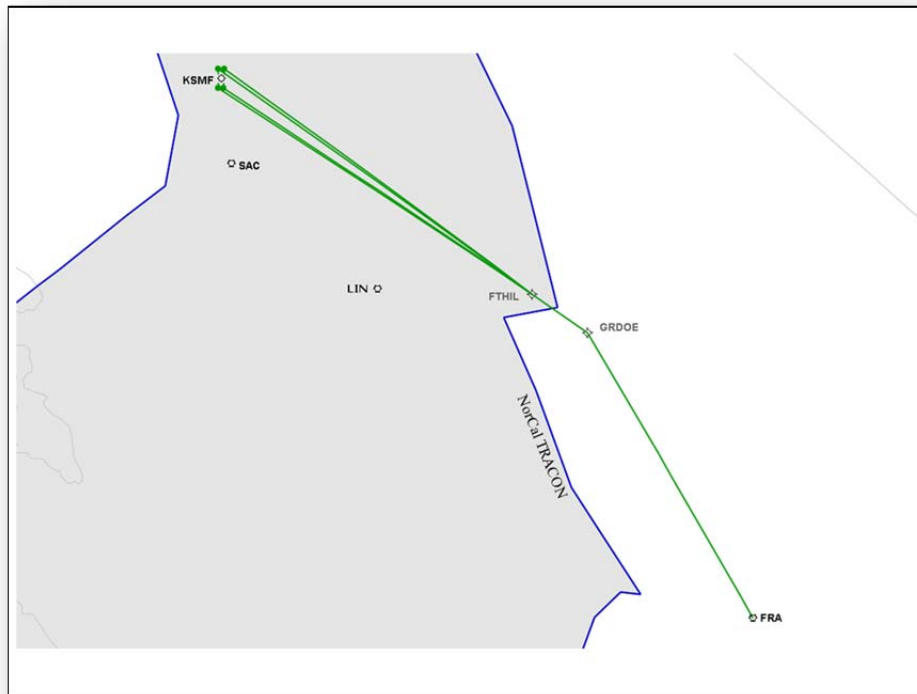


FIGURE 2. SMF FTHIL RNAV DP PROPOSED DESIGN (Will replace Figure 3 of PFD)

Northern California (NorCal) OAPM Design Package

SMF GRDOE RNAV DP (formerly SMF FROGO SID)

NorCal SMF_GRDOE RNAV DP_Ver 6.3 SMF_GRDOE_DP_ver6.3

Name of Change	Date
SMF GRDOE RNAV DP	12/21/2012
Change Classification	Current Phase of Design
Terminal Departure Procedure (DP)	<input type="checkbox"/> Preliminary Design (PD) <input type="checkbox"/> Operational Design (OD) <input type="checkbox"/> Operational Design Complete (ODC) <input checked="" type="checkbox"/> Proposed Final Design (PFD)
OAPM Study Team Reference(s)	Implementation Date
4.4.2.1	2014
Affected Facilities and Positions, Areas, and/or Sectors	Facility Points of Contact
Oakland ARTCC (ZOA): Sectors: 15-Clovis High 22 29-Linden High 34-Modesto High Northern California TRACON (NCT): Sectors: Expo Paradise Kirkwood Sacramento Tower (SMF)	ZOA: James Meadows 510-745-3469 Robert Newray 510-918-6859 NCT: Paul Pegadiotes 916-366-4048 Richard Hull 916-201-3206 SMF: Rhonda Legge 916-929-5151 Jaime Taylor 916-956-5027
Related/Dependent Submissions	Associated Data Files
NCT SMF North-wind and South-wind Plan Airspace Change	Master TARGETS File

Purpose

The purpose of the proposed procedure is to enhance the current procedure (Figure 1) and address the following items identified by the NorCal OAPM Study and Design Teams for SMF departures:

- Current procedure conflicts with proposed OAK and SFO arrival routes.
- Industry identified flyability issues.
- Flight Tracks do not follow published route.
- Optimization of lateral/vertical flight paths.

Northern California (NorCal) OAPM Design Package

SMF GRDOE RNAV DP (formerly SMF FROGO SID)

NorCal SMF_GRDOE RNAV DP_Ver 6.3 SMF_GRDOE_DP_ver6.3

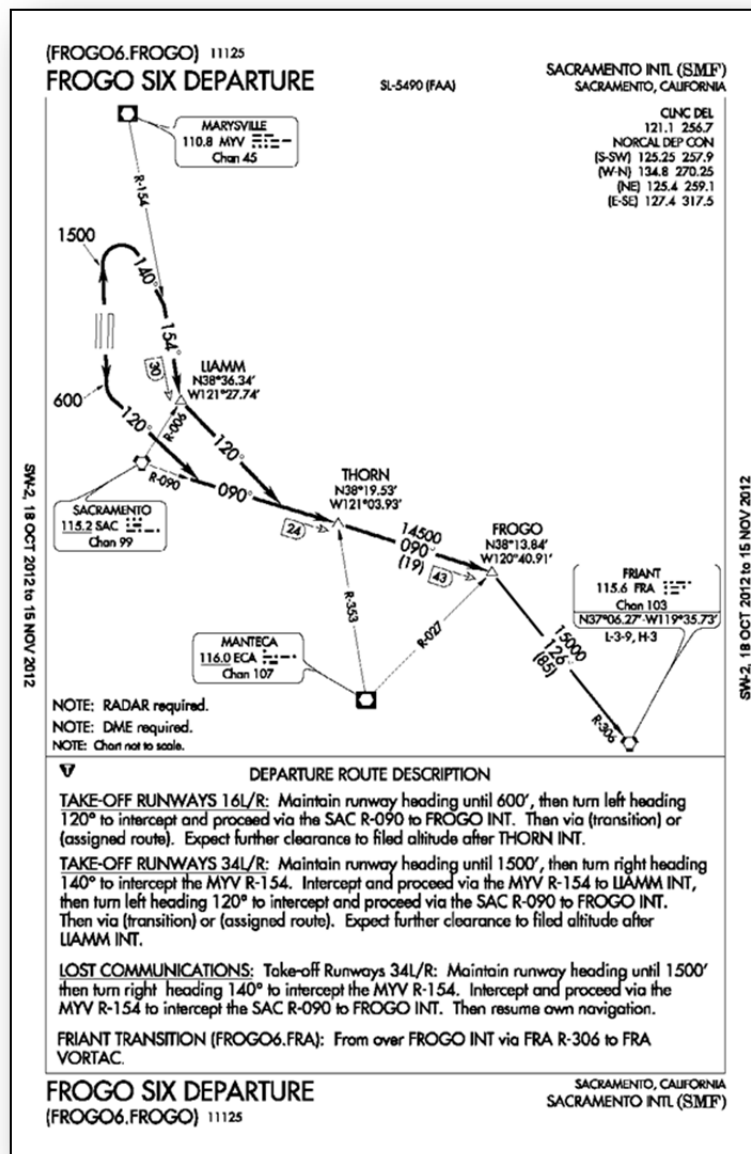


Figure 1: Current Procedure

Study Team Recommendations

The NorCal Study Team examined several alternatives to deconflict the SMF FROGO SID from the OAK MADN and SFO MOD arrivals. The alternatives explored were:

- Swapping FROGO and the WRAPS procedures at SMF.
- Moving the FROGO east to evaluate higher altitudes.

Northern California (NorCal) OAPM Design Package

SMF GRDOE RNAV DP (formerly SMF FROGO SID)

NorCal SMF_GRDOE RNAV DP_Ver 6.3 SMF_GRDOE_DP_ver6.3

- Procedural de-confliction of the SMF FROGO from the OAK MADN and SFO MOD STARs.

It was determined by the NorCal Study Team that no procedural gain could be derived by amending the current SMF FROGO procedure without adversely impacting surrounding traffic.

Figure 1 illustrates the published procedure (solid teal) and the NorCal Study Team's proposed routes (dashed red and dashed black), as well as current tracks (pink).

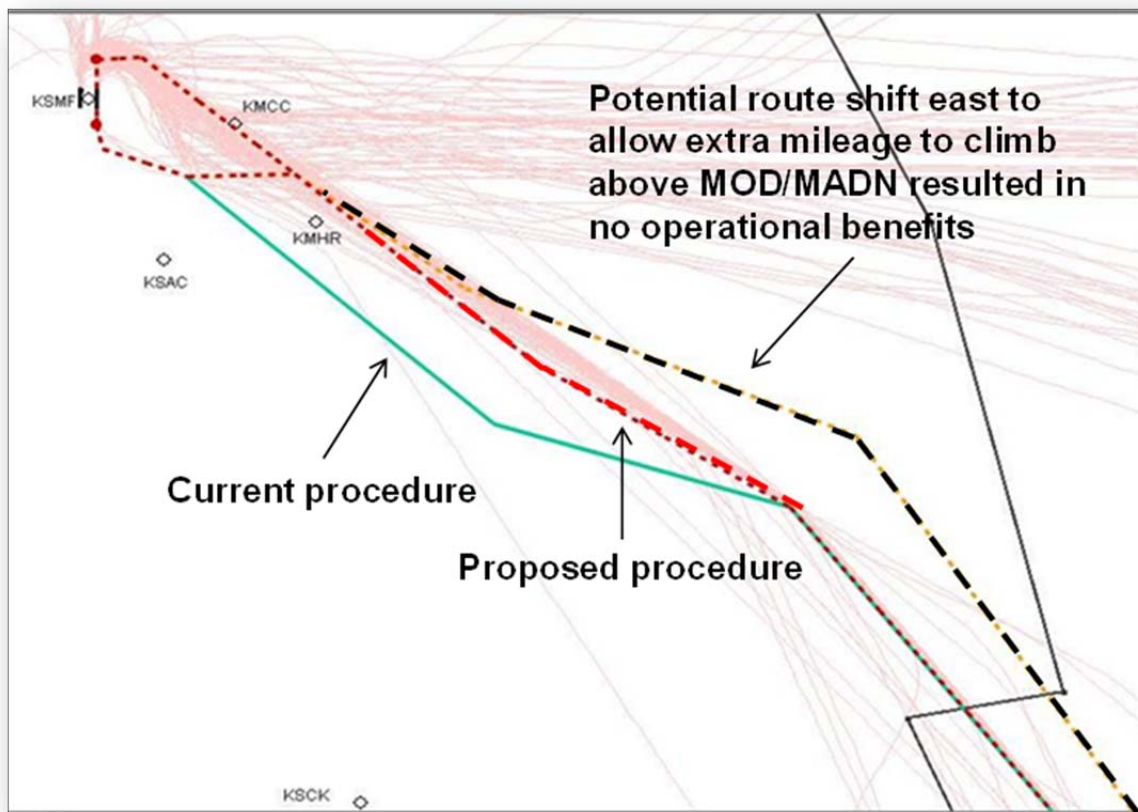


Figure 2: Study Team Recommendation

Northern California (NorCal) OAPM Design Package

SMF GRDOE RNAV DP (formerly SMF FROGO SID)

NorCal SMF_GRDOE RNAV DP_Ver 6.3 SMF_GRDOE_DP_ver6.3

Proposed Final Design

The NorCal Design Team is proposing the creation of the new SMF GRDOE RNAV DP (Figure 3) to optimize and add efficiency to current operations as well as address issues identified by the NorCal Study Team. The current conventional SMF FROGO SID will continue to be used by aircraft unable to utilize Performance Based Navigation (PBN) procedures.

The new SMF GRDOE RNAV DP is illustrated in Figure 3. The design elements and benefits include:

- Use of Performance Based Navigation (PBN).
- Optimization of lateral flight paths.
- Elimination of ground based Navaid dependency.
- Predictable and repeatable flight tracks.
- Reduction in controller workload and controller/pilot transmissions.
- Efficient Cost to Carry (CTC) fuel planning.
- Procedurally de-conflicted from other proposed Bay Area arrival procedures.
- Differs from the NorCal Study Team proposal by providing a shorter and predictable route.

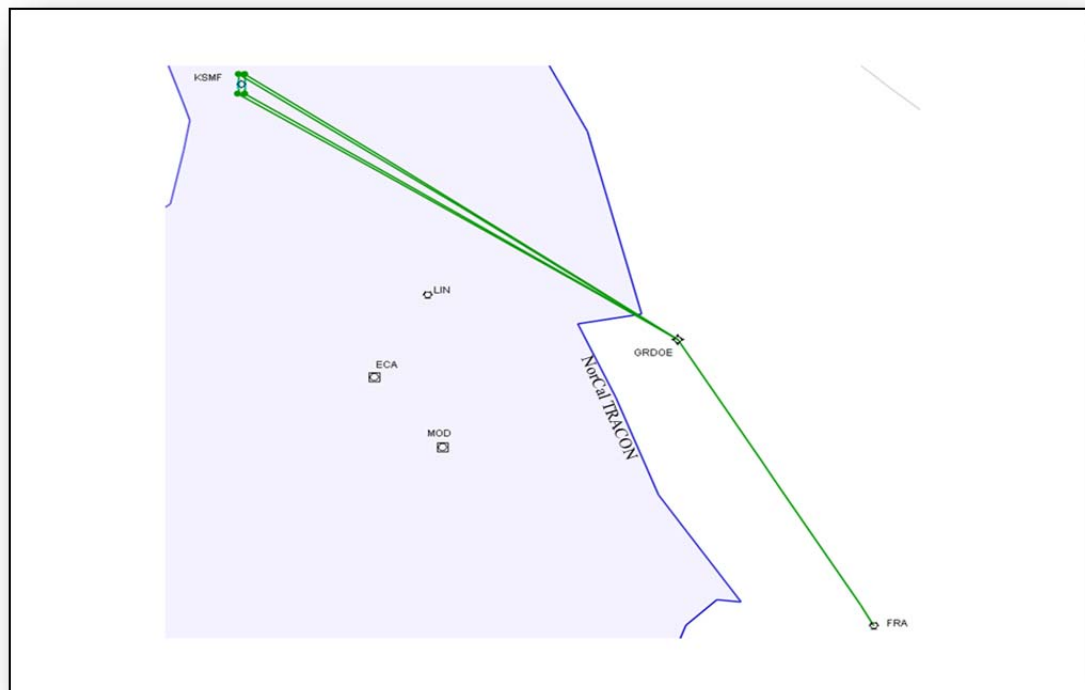


Figure 1: Proposed Procedure

Northern California (NorCal) OAPM Design Package

SMF GRDOE RNAV DP (formerly SMF FROGO SID)

NorCal SMF_GRDOE RNAV DP_Ver 6.3 SMF_GRDOE_DP_ver6.3

Additional Design Considerations

Validation of the proposed design has been accomplished through Human-in-the-Loop (HITL) simulations.

The proposed changes do not require a spectrum analysis.

Implementation Dependencies

The SMF GRDOE RNAV DP is not dependent on any other proposed designs and can be submitted separately as soon as practical for action/processing.

This proposed design requires amendments/modifications to:

- ZOA and NCT Standard Operating Procedures (SOP).
- ZOA/NCT and NCT/SMF Letters of Agreement (LOA).
- Automation.
- NCT SMF North-wind and South-wind Plan Airspace.

No additional staffing, facilities or equipment is anticipated for this proposed design.

Attachments

Terminal Procedures:

- TARGETS Distribution Package.
- Flight Simulator Worksheet.
- RNAV Pro analysis results.
- HITL Documentation.

Northern California (NorCal) OAPM Design Package

SMF GRDOE RNAV DP (formerly SMF FROGO SID)

NorCal SMF_GRDOE RNAV DP_Ver 6.3.docx SMF_GRDOE_DP_ver6.3

Review Signatures

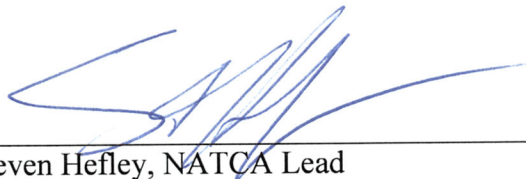
The D&I Team reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.



Patricia Daniel, FAA Lead
Northern California OAPM

1-24-13

Date



Steven Hefley, NATCA Lead
Northern California OAPM

1/24/13

Date



John F. Fisher, Facility POC
Oakland ARTCC

1/24/13

Date



Robert Newray, NATCA POC
Oakland ARTCC

1/24/13

Date



Paul Pegadiotes, Facility POC
Northern California TRACON

1/24/13

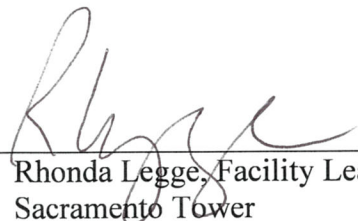
Date



Richard Hull, NATCA POC
Northern California TRACON

1/24/13

Date



Rhonda Legge, Facility Lead
Sacramento Tower

1/11/13

Date



Jaime Taylor, NATCA Lead
Sacramento Tower

1/11/13

Date

Northern California (NorCal) OAPM Design Package

SMF RVRCT RNAV DP (formerly SMF DUDES SID)

NorCal SMF_RVRCT RNAV DP_Ver 6.3 SMF_RVRCT_DP_ver6.3

Name of Change	Date
SMF RVRCT RNAV DP	12/21/2012
Change Classification	Current Phase of Design
Terminal Departure Procedure (DP)	<input type="checkbox"/> Preliminary Design (PD) <input type="checkbox"/> Operational Design (OD) <input type="checkbox"/> Operational Design Complete (ODC) <input checked="" type="checkbox"/> Proposed Final Design (PFD)
OAPM Study Team Reference(s)	Implementation Date
None	2014
Affected Facilities and Positions, Areas, and/or Sectors	Facility Points of Contact
Oakland ARTCC (ZOA): Sectors: 29-Linden High 30-Mina High 32 43-Mustang High 44 45 Northern California TRACON (NCT): Sectors: Expo Paradise Buttes Elkhorn Sacramento Tower (SMF)	ZOA: John Fisher 510-745-3744 Robert Newray 510-918-6859 NCT: Paul Pegadiotes 916-366-4048 Richard Hull 916-201-3206 SMF: Rhonda Legge 916-929-5151 Jaime Taylor 916-956-5027
Related/Dependent Submissions	Associated Data Files
NCT SMF North-wind Plan Airspace Change	Master TARGETS File

Purpose

The purpose of the proposed procedure is to enhance the current conventional SMF DUDES SID (Figure 1) and address the following concerns identified by the NorCal OAPM Design Team for SMF departures:

- Flight Tracks do not follow published route.
- Lack of repeatable predictable flight paths.

Northern California (NorCal) OAPM Design Package

SMF RVRCT RNAV DP (formerly SMF DUDES SID)

NorCal SMF_RVRCT RNAV DP_Ver 6.3 SMF_RVRCT_DP_ver6.3

- Efficient Cost to Carry (CTC) fuel planning.
- Optimization of lateral/vertical flight paths.
- Use of Performance Based Navigation (PBN).

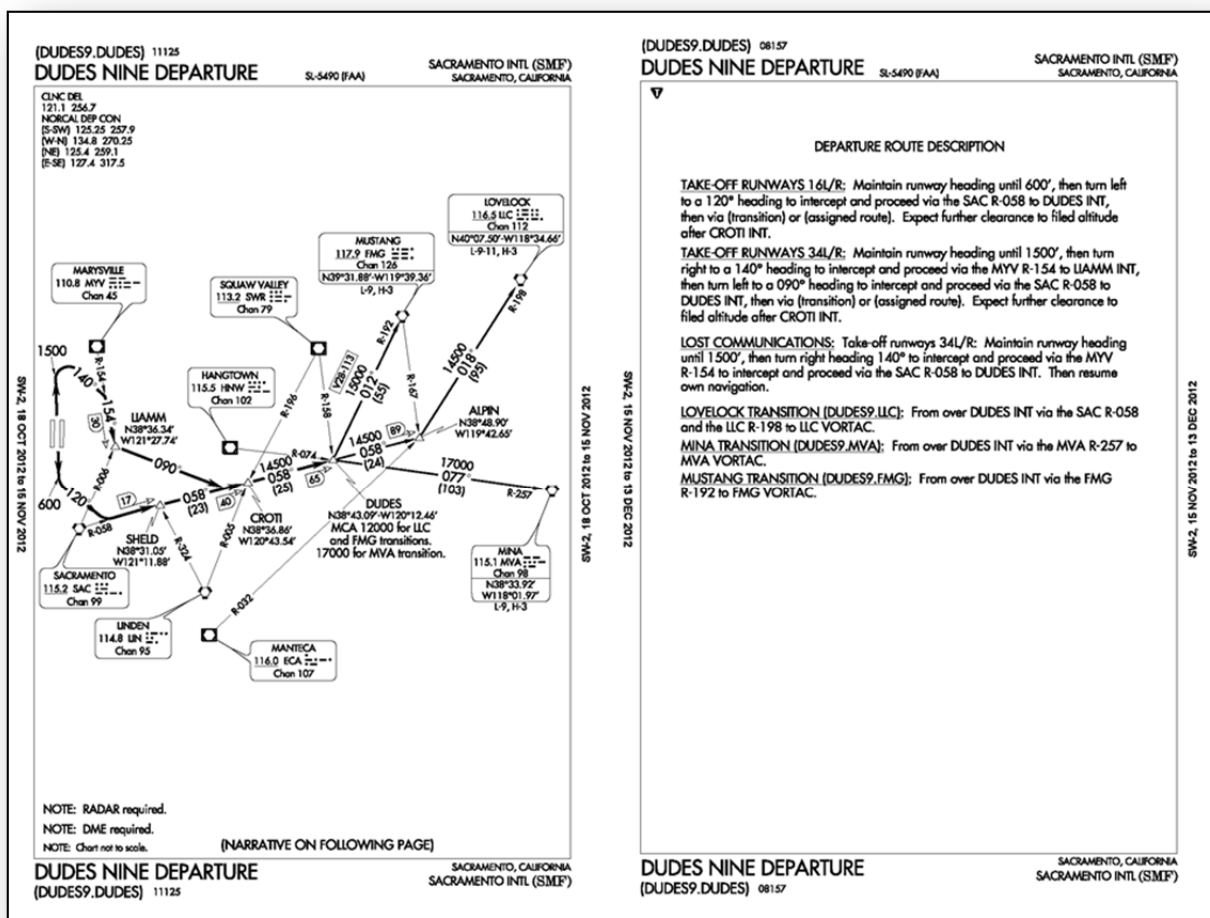


Figure 1: Current Procedure

Study Team Recommendation

The NorCal Study Team did not provide a recommendation for the current SMF DUDES SID, however after further analysis the NorCal Design Team concluded that benefits from optimization would be realized for SMF Runway 34 departures.¹

¹ SMF DUDES Runway 16 departures are addressed by the proposed SMF SCTWN RNAV DP.

Northern California (NorCal) OAPM Design Package

SMF RVRCT RNAV DP (formerly SMF DUDES SID)

NorCal SMF_RVRCT RNAV DP_Ver 6.3 SMF_RVRCT_DP_ver6.3

Proposed Final Design

The NorCal Design Team is proposing the creation of a new RNAV procedure for SMF Runway 34 departures to be named the SMF RVRCT RNAV DP. The current conventional SMF DUDES SID will continue to be used by aircraft unable to utilize Performance Based Navigation (PBN) procedures.

The new SMF RVRCT RNAV DP is illustrated in Figure 2. The design elements and benefits include:

- Use of Performance Based Navigation (PBN).
- Optimization of lateral flight paths.
- Elimination of ground based Navaid dependency.
- Predictable and repeatable flight tracks.
- Reduction in controller workload and controller/pilot transmissions.
- Efficient Cost to Carry (CTC) fuel planning.

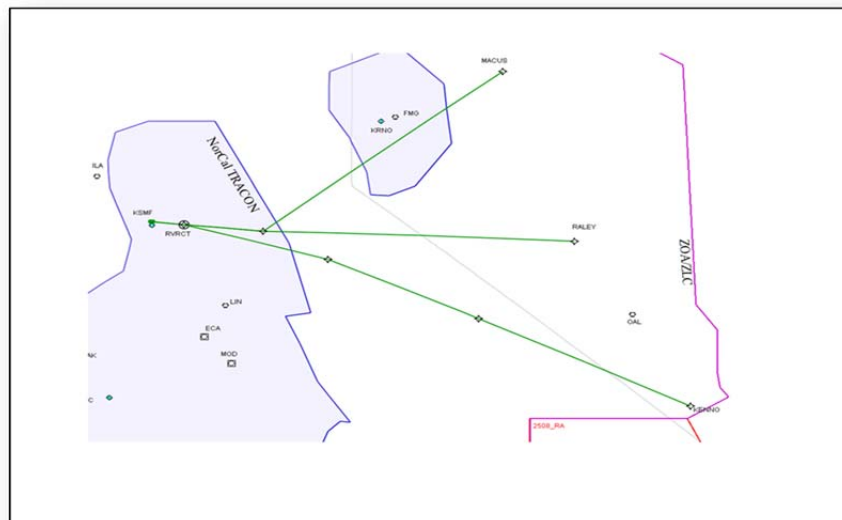


Figure 2: Proposed Procedure

Additional Design Considerations

The proposed changes do not require a spectrum analysis.

Northern California (NorCal) OAPM Design Package

SMF RVRCT RNAV DP (formerly SMF DUDES SID)

NorCal SMF_RVRCT RNAV DP_Ver 6.3 SMF_RVRCT_DP_ver6.3

Implementation Dependencies

The SMF RVRCT RNAV DP is not dependent on any other proposed designs and can be submitted separately as soon as practical for action/processing.

This proposed design requires amendments/modifications to:

- ZOA and NCT Standard Operating Procedures (SOP).
- ZOA/NCT and NCT/SMF Letters of Agreement (LOA).
- Automation.
- NCT SMF North-wind Plan Airspace Change.

No additional staffing, facilities or equipment is anticipated for this proposed design.

Attachments

Terminal Procedures:

- TARGETS Distribution Package.
- Flight Simulator Worksheet.
- RNAV Pro analysis results.

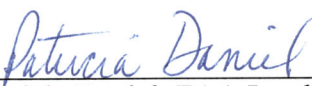
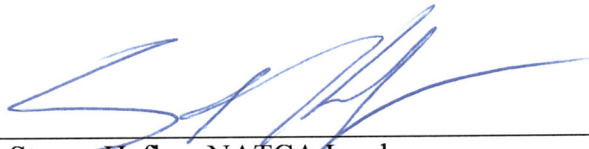





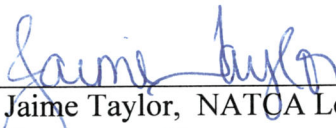
Northern California (NorCal) OAPM Design Package

SMF RVRCT RNAV DP (formerly SMF DUDES SID)

NorCal SMF_RVRCT RNAV DP_Ver 6.3.docx SMF_RVRCT_DP_ver6.3

Review Signatures

The D&I Team reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

 Patricia Daniel, FAA Lead Northern California OAPM	1-24-13 Date	 Steven Hefley, NATCA Lead Northern California OAPM	1/24/13 Date
 James F. Fisher, Facility POC Oakland ARTCC	1/24/13 Date	 Robert Newray, NATCA POC Oakland ARTCC	1/24/13 Date
 Paul Pegadiotes, Facility POC Northern California TRACON	1/24/13 Date	 Richard Hull, NATCA POC Northern California TRACON	1/24/13 Date
 Rhonda Legge, Facility Lead Sacramento Tower	1/11/13 Date	 Jaime Taylor, NATCA Lead Sacramento Tower	1/11/13 Date

Northern California (NorCal) OAPM Design Package

SMF SCTWN RNAV DP (formerly SMF DUDES SID)

NorCal SMF_SCTWN RNAV DP_Ver 6.3 SMF_SCTWN_DP_ver6.3

Name of Change	Date
SMF SCTWN RNAV DP	12/21/2014
Change Classification	Current Phase of Design
Terminal Departure Procedure (DP)	<input type="checkbox"/> Preliminary Design (PD) <input type="checkbox"/> Operational Design (OD) <input type="checkbox"/> Operational Design Complete (ODC) <input checked="" type="checkbox"/> Proposed Final Design (PFD)
OAPM Study Team Reference(s)	Implementation Date
None	2014
Affected Facilities and Positions, Areas, and/or Sectors	Facility Points of Contact
Oakland ARTCC (ZOA): Sectors: 29-Linden High 30-Mina High 32 33-Coaldale High 34-Modesto High 43-Mustang High 44 45 Northern California TRACON (NCT): Sectors: Expo Paradise Sacramento Tower (SMF)	ZOA: John Fisher 510-745-3744 Robert Newray 510-918-6859 NCT: Paul Pegadiotes 916-366-4048 Richard Hull 916-201-3206 SMF: Rhonda Legge 916-929-5151 Jaime Taylor 916-956-5027
Related/Dependent Submissions	Associated Data Files
NCT SMF South-wind Plan Airspace Change	Master TARGETS File

Purpose

The purpose of the proposed procedure is to enhance the current conventional SMF DUDES SID (Figure 1) and address the following items identified by the NorCal OAPM Design Team for SMF departures:

- Flight Tracks do not follow published route.
- Lack of repeatable predictable flight paths.
- Inefficient Cost to Carry (CTC) fuel planning.

Northern California (NorCal) OAPM Design Package

SMF SCTWN RNAV DP (formerly SMF DUDES SID)

NorCal SMF_SCTWN RNAV DP_Ver 6.3 SMF_SCTWN_DP_ver6.3

- Optimization of lateral/vertical flight paths.
- Reduction of ground based Navaid dependency.

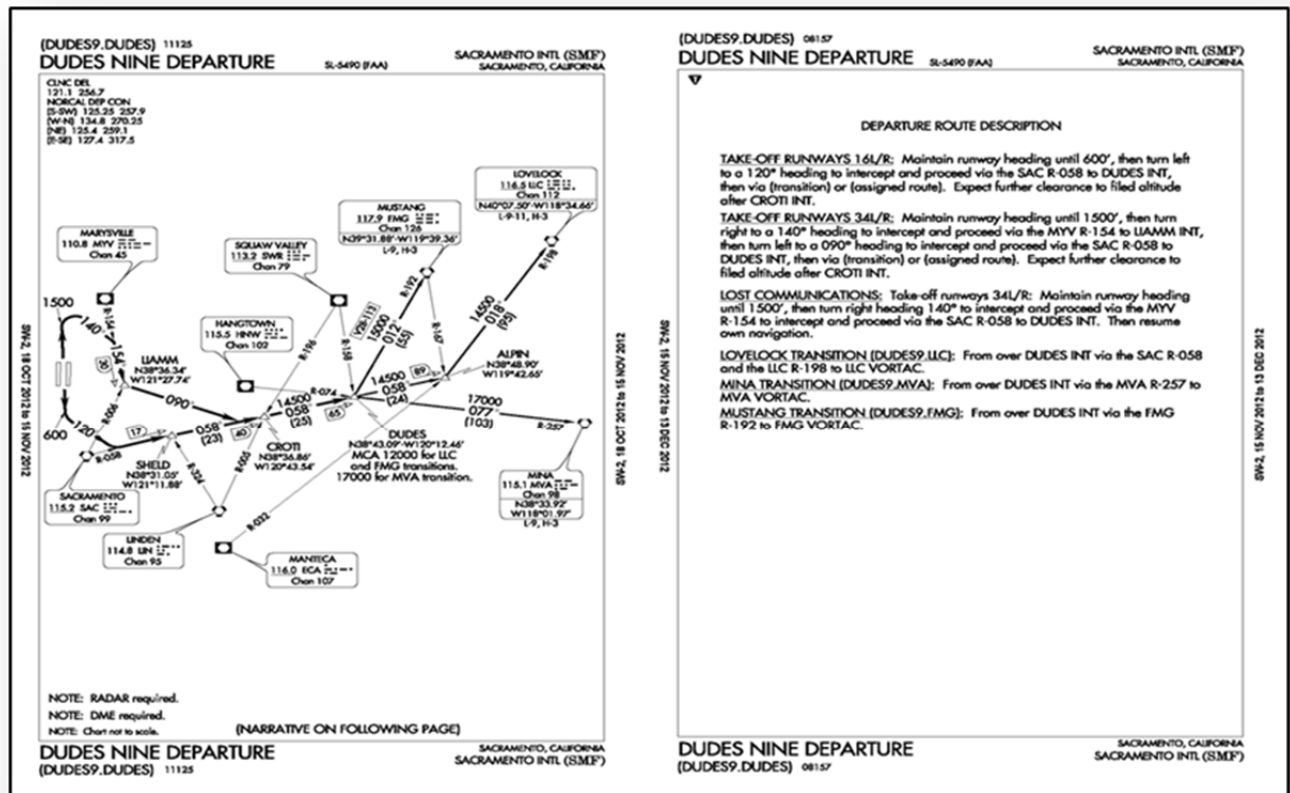


Figure 1: Current Procedure

Study Team Recommendation

The NorCal Study Team did not provide recommendation for the current SMF DUDES SID, however after further analysis the NorCal Design Team concluded that benefits from optimization would be realized for the SMF Runway 16 departures.¹

¹ The SMF DUDES Runway 34 departures are addressed in the proposed SMF RVRCT RNAV DP.

Northern California (NorCal) OAPM Design Package

SMF SCTWN RNAV DP (formerly SMF DUDES SID)

NorCal SMF_SCTWN RNAV DP_Ver 6.3 SMF_SCTWN_DP_ver6.3

Proposed Final Design

The NorCal Design Team is proposing the creation of a new RNAV procedure for SMF Runway 16 departures to be named the SMF SCTWN RNAV DP. The current SMF DUDES SID will continue to be used by aircraft unable to utilize Performance Based Navigation (PBN) procedures.

The new SMF SCTWN RNAV DP is illustrated in Figure 2. The design elements and benefits include:

- Use of Performance Based Navigation (PBN).
- Optimization of lateral flight paths.
- Elimination of ground based Navaid dependency.
- Predictable and repeatable flight tracks.
- Reduction in controller workload and controller/pilot transmissions.
- Efficient Cost to Carry (CTC) fuel planning.

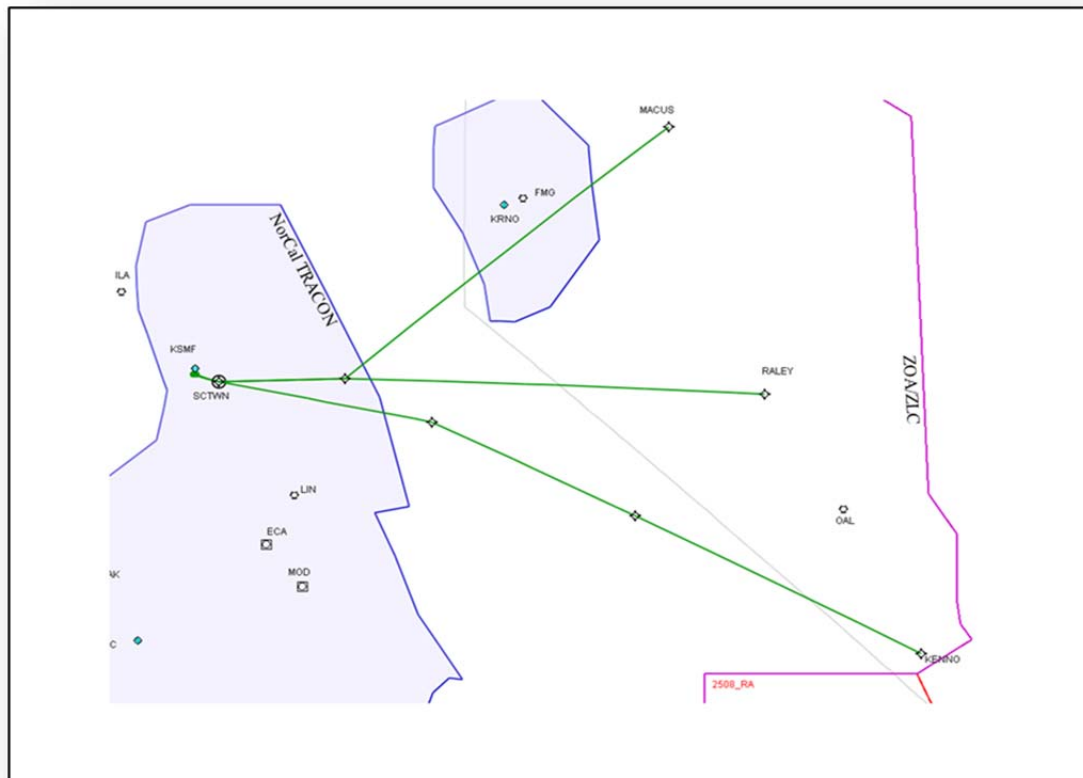


Figure 2: Proposed Procedure

Northern California (NorCal) OAPM Design Package

SMF SCTWN RNAV DP (formerly SMF DUDES SID)

NorCal SMF_SCTWN RNAV DP_Ver 6.3 SMF_SCTWN_DP_ver6.3

Additional Design Considerations

The proposed changes do not require a spectrum analysis.

Implementation Dependencies

The SMF SCTWN RNAV is not dependent on any other proposed designs and can be submitted separately as soon as practical for action/processing.

This proposed design requires amendments/modifications to:

- ZOA and NCT Standard Operating Procedures (SOP).
- ZOA/NCT and NCT/SMF Letters of Agreement (LOA).
- Automation.
- NCT SMF South-wind Plan Airspace Change.

No additional staffing, facilities or equipment is anticipated for this proposed design.

Attachments

Terminal Procedures:

- TARGETS Distribution Package.
- Flight Simulator Worksheet.
- RNAV Pro analysis results.

Northern California (NorCal) OAPM Design Package

SMF SCTWN RNAV DP (formerly SMF DUDES SID)

NorCal SMF_SCTWN RNAV DP_Ver 6.3.docx SMF_SCTWN_DP_ver6.3

Review Signatures

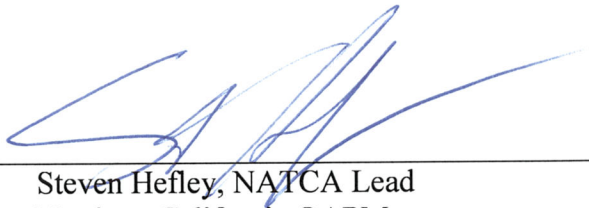
The D&I Team reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.



Patricia Daniel, FAA Lead
Northern California OAPM

1-24-13


Date



Steven Hefley, NATCA Lead
Northern California OAPM

1/24/13

Date



James F. Fisher, Facility POC
Oakland ARTCC

1/24/13

Date



Robert Newray, NATCA POC
Oakland ARTCC

1/24/13

Date



Paul Pegadiotes, Facility POC
Northern California TRACON

1/24/13

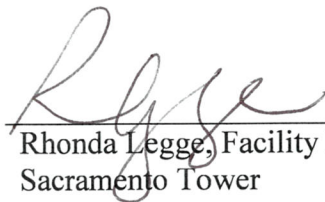
Date



Richard Hull, NATCA POC
Northern California TRACON

1/24/13

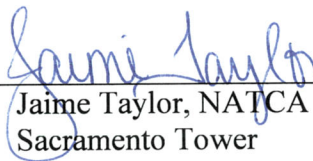
Date



Rhonda Legge, Facility Lead
Sacramento Tower

1/11/13

Date



Jaime Taylor, NATCA Lead
Sacramento Tower

1/11/13

Date

Northern California (NorCal) OAPM Design Package

SMF SLMMR STAR (formerly SMF FLUNK STAR)

NorCal SMF_SLMMR_STAR_Ver 6.3 SMF_SLMMR_STAR_ver6.3

Name of Change	Date
SMF SLMMR STAR	12/21/2012
Change Classification	Current Phase of Design
Terminal Procedure STAR	<input type="checkbox"/> Preliminary Design (PD) <input type="checkbox"/> Operational Design (OD) <input type="checkbox"/> Operational Design Complete (ODC) <input checked="" type="checkbox"/> Proposed Final Design (PFD)
OAPM Study Team Reference(s)	Implementation Date
None	2014
Affected Facilities and Positions, Areas, and/or Sectors	Facility Points of Contact
Oakland ARTCC (ZOA): Sectors: 29-Linden High, 33-Coaldale High, 30-Mina High, 32 34-Modesto High, 43-Mustang High 44 45 46 Northern California TRACON (NCT): Sectors: Expo Delta Paradise Elkhorn Buttes	ZOA: James Meadows 510-745-3469 Robert Newray 510-918-6859 NCT: Paul Pegadiotes 916-366-4048 Richard Hull 916-201-3206
Related/Dependent Submissions	Associated Data Files
NCT SMF North-wind and South-wind Plan Airspace Change	Master TARGETS File

Purpose

The purpose of the proposed procedure is to enhance the current conventional SMF FLUNK STAR (Figure 1) and address the following items identified by the NorCal OAPM Design Team for SMF Arrivals:

- Flight Tracks do not follow published route.

Northern California (NorCal) OAPM Design Package

SMF SLMMR STAR (formerly SMF FLUNK STAR)

NorCal SMF_SLMMR_STAR_Ver 6.3 SMF_SLMMR_STAR_ver6.3

- Lack of repeatable predictable flight paths.
- Optimization of lateral/vertical flight paths.
- Procedurally de-conflict from other area STARs.
- Efficient cost to carry (CTC) fuel planning.
- Use of Performance Based Navigation (PBN).

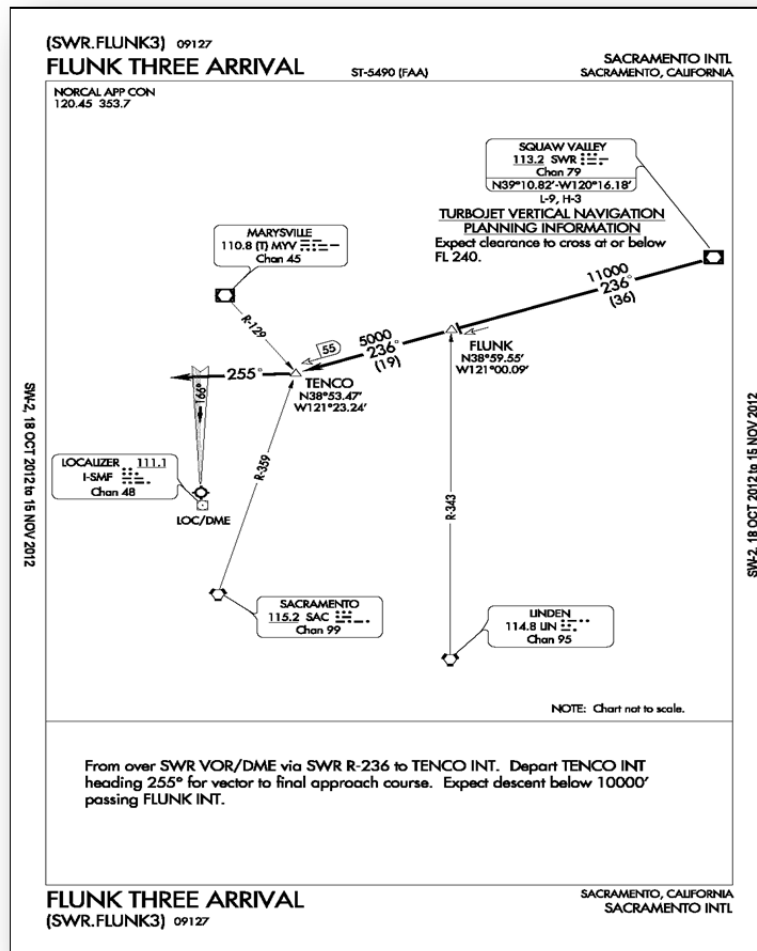


Figure 1: Current Procedure

Study Team Recommendation

The NorCal Study Team did not provide recommendation on this particular procedure, however after further analysis the NorCal Design Team proposed a new procedure to optimize and add efficiency to current operations.

Northern California (NorCal) OAPM Design Package

SMF SLMMR STAR (formerly SMF FLUNK STAR)

NorCal SMF_SLMMR_STAR_Ver 6.3 SMF_SLMMR_STAR_ver6.3

Proposed Final Design

The NorCal Design Team is proposing a new procedure named the SMF SLMMR STAR. The current conventional SMF FLUNK STAR will continue to be used by aircraft unable to utilize Performance Based Navigation (PBN) procedures. The new SMF SLMMR STAR is deconflicted from the Truckee and Tahoe Airport arrival and departure traffic flows.

The new SMF SLMMR STAR is illustrated in Figure 2. Design enhancements and benefits include:

- Three (3) optimized transitions improving flow efficiency and flexibility.
- Use of Performance Based Navigation (PBN).
- Optimization of lateral/vertical flight paths.
- Elimination of ground based Navaid dependency.
- Predictable and repeatable flight tracks.
- Reduction in controller workload and controller/pilot transmissions.
- Efficient Cost to Carry (CTC) fuel planning.

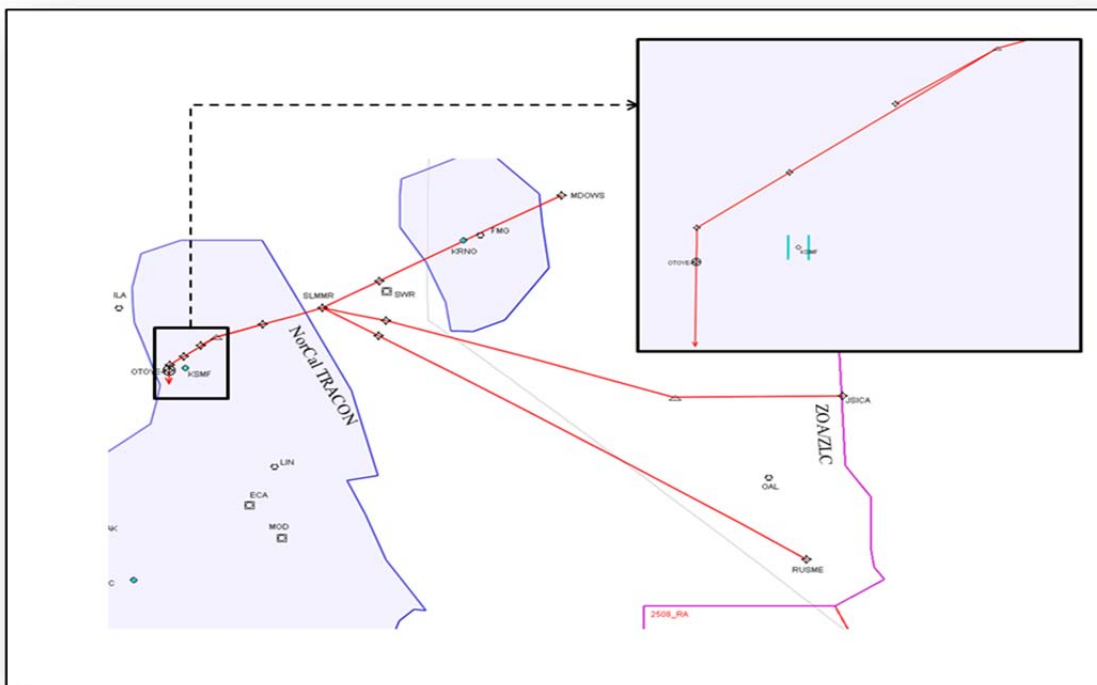


Figure 2: Proposed Procedure

Northern California (NorCal) OAPM Design Package

SMF SLMMR STAR (formerly SMF FLUNK STAR)

NorCal SMF_SLMMR_STAR_Ver 6.3 SMF_SLMMR_STAR_ver6.3

Additional Design Considerations

The proposed changes do not require a spectrum analysis.

Implementation Dependencies

The SMF SLMMR STAR is not dependent on any other proposed designs and can be submitted separately as soon as practical for action/processing.

This proposed design requires amendments/modifications to:

- NCT SMF North-wind and South-wind Plan Airspace.
- ZOA and NCT Standard Operating Procedures (SOP).
- ZOA/NCT Letters of Agreement (LOA).
- Automation.

Attachments

Terminal Procedures:

- TARGETS Distribution Package.
- Flight Simulator Worksheet.
- RNAV Pro analysis results.
- HITL Documentation.

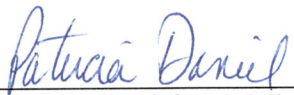
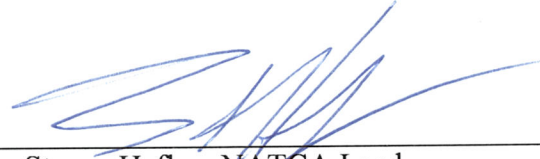
Northern California (NorCal) OAPM Design Package

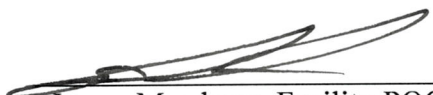
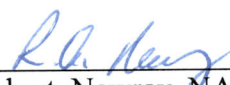
SMF SLMMR STAR (formerly SMF FLUNK STAR)



NorCal SMF_SLMMR_STAR_Ver 6.3.docx SMF_SLMMR_STAR_ver6.3

Review Signatures

The D&I Team reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

	1-24-13		1/24/13
Patricia Daniel, FAA Lead Northern California OAPM	Date	Steven Hefley, NATCA Lead Northern California OAPM	Date

	1/24/13		1/24/13
James Meadows, Facility POC Oakland ARTCC	Date	Robert Newray, NATCA POC Oakland ARTCC	Date

	1/24/13		1/24/13
Paul Pegadinos, Facility POC Northern California TRACON	Date	Richard Hull, NATCA POC Northern California TRACON	Date

Northern California (NorCal) OAPM Design Package

SMF SUUTR STAR (formerly SMF WRAPS STAR)

NorCal OAPM SMF_SUUTR_STAR_Ver 6.3 SMF_SUUTR_STAR_ver6.3

Name of Change	Date
SMF SUUTR STAR	12/21/2012
Change Classification	Current Phase of Design
Terminal Procedure STAR	<input type="checkbox"/> Preliminary Design (PD) <input type="checkbox"/> Operational Design (OD) <input type="checkbox"/> Operational Design Complete (ODC) <input checked="" type="checkbox"/> Proposed Final Design (PFD)
OAPM Study Team Reference(s)	Implementation Date
4.8.1.1	2014
Affected Facilities and Positions, Areas, and/or Sectors	Facility Points of Contact
Oakland ARTCC (ZOA): Sectors: 15-Clovis High 34-Modesto High Northern California TRACON (NCT): Sectors: Sunol Paradise Elkhorn Delta Kirkwood Fairfield	ZOA: James Meadows 510-745-3469 Robert Newray 510-918-6859 NCT: Paul Pegadiotes 916-366-4048 Richard Hull 916-201-3206
Related/Dependent Submissions	Associated Data Files
NCT SMF North-wind and South-wind Plan Airspace Change	Master TARGETS File

Purpose

The purpose of the proposed procedure is to enhance the current conventional SMF WRAPS STAR (Figure 1) and address the following items identified by the NorCal OAPM Study and Design Teams:

- Flight Tracks do not follow published route.
- Lack of repeatable predictable flight paths.

Northern California (NorCal) OAPM Design Package

SMF SUUTR STAR (formerly SMF WRAPS STAR)

NorCal OAPM SMF_SUUTR_STAR_Ver 6.3 SMF_SUUTR_STAR_ver6.3

- Optimization of lateral/vertical flight paths.
- Procedurally de-conflict from other area STARs.
- Efficient Cost to Carry (CTC) fuel planning.
- Use of Performance Based Navigation (PBN).

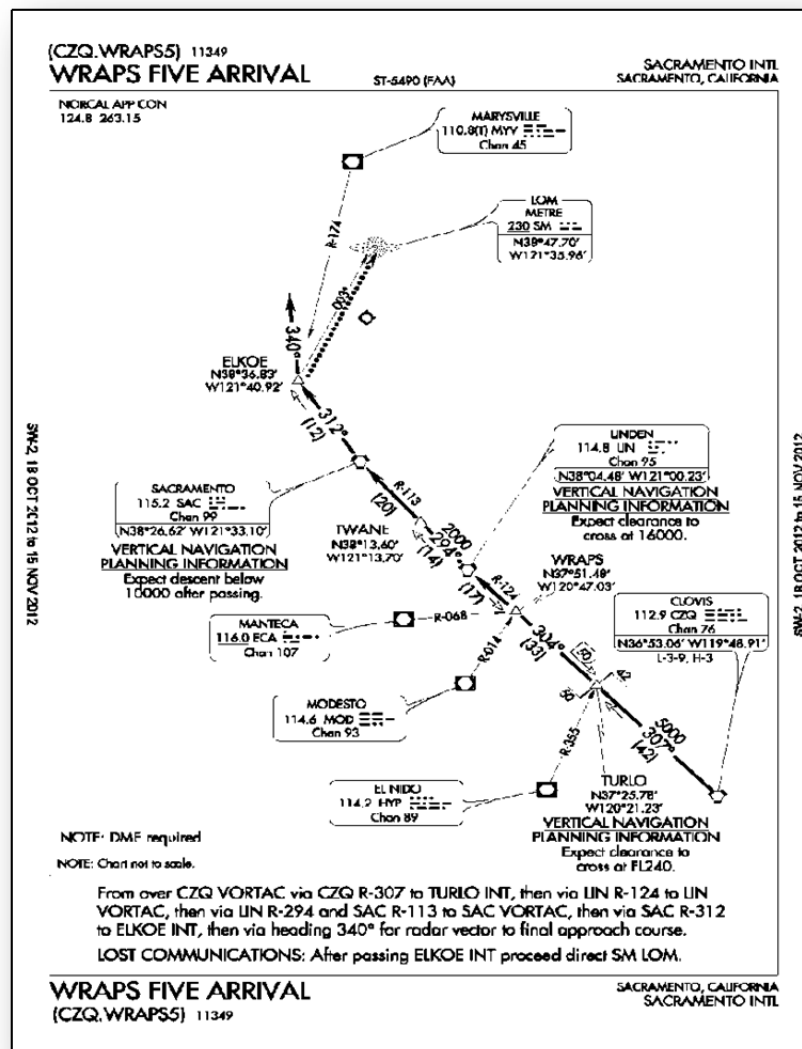


Figure 1: Current Procedure

Study Team Recommendation

The NorCal OAPM Study Team made the following recommendations:

- Create an optimized RNAV STAR with OPD benefits.

Northern California (NorCal) OAPM Design Package

SMF SUUTR STAR (formerly SMF WRAPS STAR)

NorCal OAPM SMF_SUUTR_STAR_Ver 6.3 SMF_SUUTR_STAR_ver6.3

- Create an RNAV STAR that provides a predictable, repeatable path.
- Align procedures with current traffic flows.
- Accommodate multiple approach transitions.
- Procedurally de-conflict from other area STARs.

Figure 2 illustrates the published procedure (solid purple) and the proposed routes (dashed red), as well as current tracks (pink).

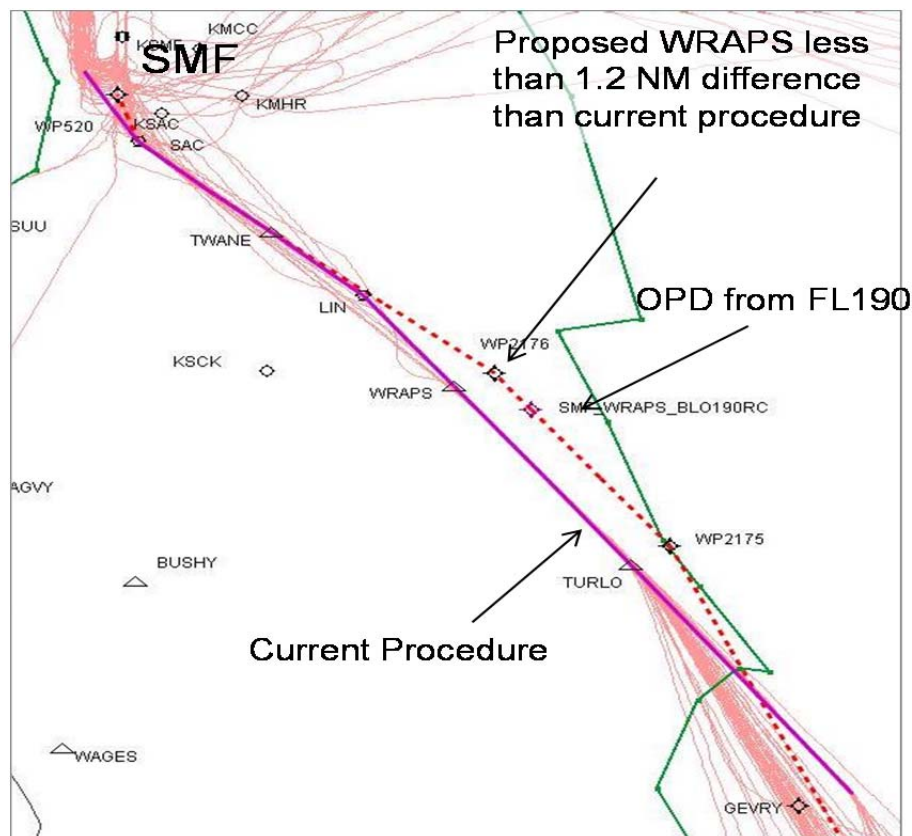


Figure 2: Study Team Recommendation

Proposed Final Design

The NorCal OAPM Design Team is proposing a new procedure named the SMF SUUTR STAR to address the issues identified by the NorCal OAPM Study Team. The current conventional SMF WRAPS STAR will continue to be used by aircraft unable to utilize Performance Based Navigation (PBN) procedures.

Northern California (NorCal) OAPM Design Package

SMF SUUTR STAR (formerly SMF WRAPS STAR)

NorCal OAPM SMF_SUUTR_STAR_Ver 6.3 SMF_SUUTR_STAR_ver6.3

The new SMF SUUTR STAR is illustrated in Figure 3. Design enhancements and benefits include:

- De-confliction from the Oakland (OAK), San Francisco (SFO) and San Jose (SJC) procedures.
- Use of Performance Based Navigation (PBN).
- Optimization of lateral/vertical flight paths.
- Elimination of ground based Navaid dependency.
- Predictable and repeatable flight tracks.
- Reduction in controller workload and controller/pilot transmissions.
- Efficient Cost to Carry (CTC) fuel planning.

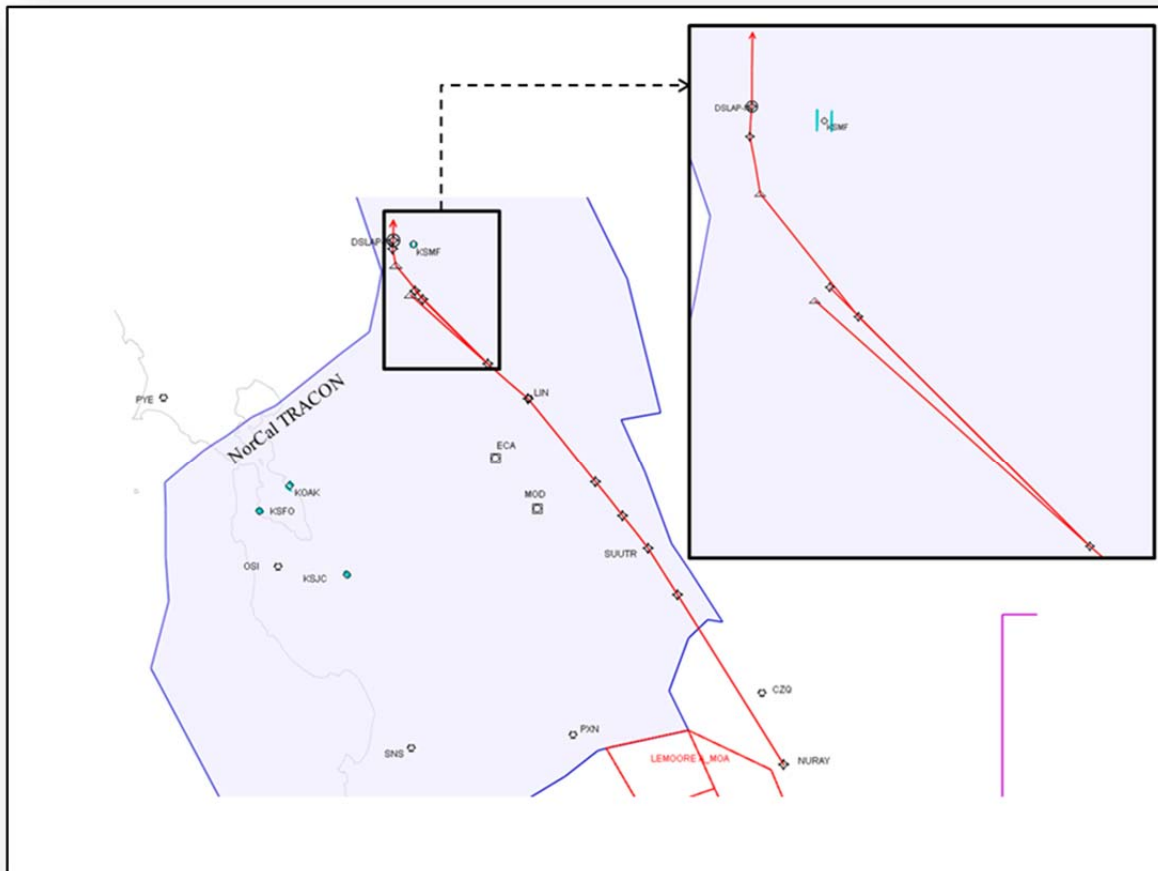


Figure 3: Proposed Procedure

The proposed SMF SUUTR STAR design differs from the Study Team recommendation and the current procedure by providing a shorter lateral track.

Northern California (NorCal) OAPM Design Package

SMF SUUTR STAR (formerly SMF WRAPS STAR)

NorCal OAPM SMF_SUUTR_STAR_Ver 6.3 SMF_SUUTR_STAR_ver6.3

Additional Design Considerations

Validation of the proposed design has been accomplished through Human-in-the-Loop (HITL) simulations.

The proposed changes do not require a spectrum analysis

Implementation Dependencies

The new SMF SUUTR STAR is not dependent on any other proposed designs and can be submitted separately as soon as practical for action/processing.

This proposed design requires amendments/modifications to:

- ZOA and NCT Standard Operating Procedures (SOP).
- ZOA/ZLA and ZOA/NCT Letters of Agreement (LOA).
- NCT SMF North-wind and South-wind Plan Airspace.
- Automation.

No additional staffing, facilities or equipment is anticipated for this proposed design.

Attachments

Terminal Procedures:

- TARGETS Distribution Package.
- Flight Simulator Worksheet.
- RNAV Pro analysis results.
- HITL Documentation.

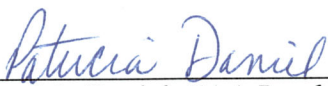
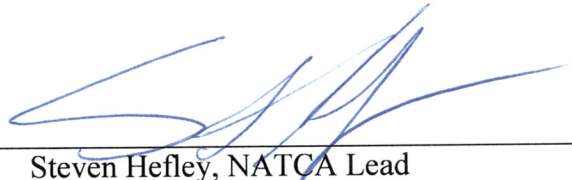
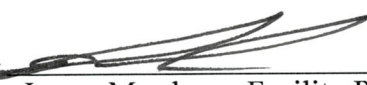
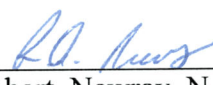


Northern California (NorCal) OAPM Design Package

SMF SUUTR STAR (formerly SMF WRAPS STAR)

NorCal OAPM SMF_SUUTR_STAR_Ver 6.3.docx SMF_SUUTR_STAR_ver6.3

Review Signatures

The D&I Team reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

 Patricia Daniel, FAA Lead Northern California OAPM	1-24-13 Date	 Steven Hefley, NATCA Lead Northern California OAPM	1/24/13 Date
 James Meadows, Facility POC Oakland ARTCC	1/24/13 Date	 Robert Newray, NATCA POC Oakland ARTCC	1/24/13 Date
 Paul Pegadiotes, Facility POC Northern California TRACON	1/24/13 Date	 Richard Hull, NATCA POC Northern California TRACON	1/24/13 Date