



Meeting Announcement

Technical Working Group

Tuesday, January 18, 2022
12:00 p.m. – 1:30 p.m.

BY VIDEO CONFERENCE ONLY

Please click the link below to join the webinar:

<https://smcgov.zoom.us/j/99948184888>

Or Dial-in:

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Note: To arrange an accommodation under the Americans with Disabilities Act to participate in this public meeting, please call (650) 363-4220 at least 2 days before the meeting date.

**Please see instructions for written and spoken comments at the end of this agenda.

AGENDA

Call to Order

Public Comment on Items NOT on the Agenda

CONSENT AGENDA

1. Action to Set Agenda and Approve Consent Agenda

2. Brown Act Remote Meetings Resolution (2 min)

Attachments: Memo and Resolution of Approval

pg. 3

REGULAR AGENDA

3. GBAS Project Update (60-min)

- a. HMMH Innovative Approach Evaluation Review
- b. SFO Update on CFPP
- c. SFO Update on Noise Measurements

pg. 8
pg. 29

4. SFO NIITE/HUSSH Implementation Update (20-min)

FUTURE ITEMS FOR DISCUSSION

- Fly Quiet Awards Update

****Instructions for Public Comment during Videoconference Meeting**

Technical Working Group

January 18, 2022

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During videoconference of the Technical Working Group subcommittee meeting, members of the public may address the Roundtable as follows:

Written Comments:

Written public comments may be emailed in advance of the meeting. Please read the following instructions carefully:

1. Your written comment should be emailed to amontescardenas@smcgov.org.
2. Your email should include the specific agenda item on which you are commenting.
3. Members of the public are limited to one comment per agenda item.
4. The length of the emailed comment should be commensurate with two minutes customarily allowed for verbal comments, which is approximately 250-300 words.
5. If your emailed comment is received by 12:00 pm on the day before the meeting, it will be provided to the Roundtable and made publicly available on the agenda website under the specific item to which comment pertains. The Roundtable will make every effort to read emails received after that time but cannot guarantee such emails will be read during the meeting, although such emails will still be included in the administrative record.

Spoken Comments:

Spoken public comments will be accepted during the meeting through Zoom. Please read the following instructions carefully:

1. The January 18, 2022 Technical Working Group meeting may be accessed through Zoom online at: <https://smcgov.zoom.us/j/99948184888>. The meeting ID: 999 4818 4888. The meeting may also be accessed via telephone by dialing in +1-669-900-6833, entering meeting ID: 999 4818 4888, then press #.
2. You may download the Zoom client or connect to the meeting using the internet browser. If you are using your browser, make sure you are using current, up-to-date browser: Chrome 30+, Firefox 27+, Microsoft Edge 12+, Safari 7+. Certain functionality may be disabled in older browsers including Internet Explorer.
3. You will be asked to enter an email address and name. We request that you identify yourself by name as this will be visible online and will be used to notify you that it is your turn to speak.
4. When the Roundtable Chairperson calls for the item on which you wish you speak click on "raise-hand" icon. You will then be called on and unmuted to speak.
5. When called, please limit your remarks to the time limit allotted.



San Francisco International
Airport/Community Roundtable

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January 13, 2022

TO: Technical Working Group

FROM: Angela Montes, Administrative Secretary

SUBJECT: Resolution to make findings allowing continued remote meetings under Brown Act

RECOMMENDATION:

Adopt a resolution finding that, as a result of the continuing COVID-19 pandemic state of emergency declared by Governor Newsom, meeting in-person would present imminent risks to the health or safety of attendees.

BACKGROUND:

On June 11, 2021, Governor Newsom issued Executive Order N-08-21, which rescinded his prior Executive Order N-29-20 and which waived, through September 30, 2021, certain provisions of the Brown Act relating to teleconferences/remote meetings. The Executive Order waived, among other things, the provisions of the Brown Act that otherwise required the physical presence of members of a local agency or other personnel in a particular location as a condition of participation or as a quorum for a public meeting. These waivers set forth in the Executive Order were to expire on October 1, 2021.

On September 16, 2021, the Governor signed Assembly Bill (AB) 361, a bill that codifies certain teleconference procedures that local agencies have adopted in response to the Governor's Brown Act-related Executive Orders. Specifically, AB 361 allows a local agency to continue to use teleconferencing under the same basic rules as provided in the Executive Orders under certain prescribed circumstances or when certain findings have been made and adopted by the local agency.

In order to continue to hold video and teleconference meetings, the Technical Working Group (TWG) of the San Francisco Airport/Community Roundtable will need to review and make findings every 30 days or thereafter that the state of emergency continues to directly impact the ability of the members to meet safely in-person and that state or local officials continue to impose or recommend measures to promote social distancing. If the TWG does continue to hold video and teleconference meetings, to meet the requirements of AB 361, the TWG will need to adopt a resolution at every meeting.



The San Mateo County Board of Supervisors has adopted a resolution to continue remote meetings and encouraged other local agencies to make similar findings.

The membership previously found, and it remains the case, that public meetings pose high risks for COVID-19 spread for several reasons. These meetings may bring together people from throughout a geographic region, increasing the opportunity for COVID-19 transmission. Further, the open nature of public meetings makes it difficult to enforce compliance with vaccination, physical distancing, masking, cough and sneeze etiquette, or other safety measures. Moreover, some of the safety measures used by private businesses to control these risks may be less effective for public agencies.

These factors continue to combine and directly impact the ability of members of the TWG to meet safely in person and to make in-person public meetings imminently risky to health and safety.

As noted above, under AB 361, local agency bodies were required to return to in-person meetings on October 1, 2021, unless they chose to continue with fully teleconferenced meetings and made the prescribed findings related to the existing state of emergency. At its meeting of December 1, 2021, the Roundtable membership adopted a resolution wherein the membership found, among other things, that as a result of the continuing COVID-19 state of emergency, meeting in-person would present imminent risks to the health or safety of attendees.

DISCUSSION:

Because local rates of transmission of COVID-19 are still in the “substantial” tier as measured by the Centers for Disease Control, we recommend that your subcommittee avail itself of the provisions of AB 361 allowing continuation of online meetings by adopting findings to the effect that conducting in-person meetings would present an imminent risk to the health and safety of attendees. A resolution to that effect and directing staff to return each 30 days with the opportunity to renew such findings, is attached hereto.

FISCAL IMPACT:

None

RESOLUTION NO. TWG22-01

RESOLUTION FINDING THAT, AS A RESULT OF THE CONTINUING COVID-19 PANDEMIC STATE OF EMERGENCY DECLARED BY GOVERNOR NEWSOM, MEETING IN PERSON FOR MEETINGS OF THE TECHNICAL WORKING GROUP, OF THE SAN FRANCISCO INTERNATIONAL AIRPORT/COMMUNITY ROUNDTABLE, WOULD PRESENT IMMINENT RISKS TO THE HEALTH OR SAFETY OF ATTENDEES

RESOLVED, by the Technical Working Group that

WHEREAS, on March 4, 2020, the Governor proclaimed pursuant to his authority under the California Emergency Services Act, California Government Code section 8625, that a state of emergency exists with regard to a novel coronavirus (a disease now known as COVID-19); and

WHEREAS, on June 4, 2021, the Governor clarified that the “reopening” of California on June 15, 2021 did not include any change to the proclaimed state of emergency or the powers exercised thereunder, and as of the date of this Resolution, neither the Governor nor the Legislature have exercised their respective powers pursuant to California Government Code section 8629 to lift the state of emergency either by proclamation or by concurrent resolution in the state Legislature; and

WHEREAS, on March 17, 2020, Governor Newsom issued Executive Order N-29-20 that suspended the teleconferencing rules set forth in the California Open Meeting law, Government Code section 54950 et seq. (the “Brown Act”), provided certain requirements were met and followed; and

WHEREAS, on September 16, 2021, Governor Newsom signed AB 361 that provides that a legislative body subject to the Brown Act may continue to meet without fully complying with the teleconferencing rules in the Brown Act provided the legislative body determines that meeting in person would present imminent risks to the health or safety of attendees, and further requires that certain findings be made by the legislative body every thirty (30) days or when meeting next; and,

WHEREAS, the Technical Working Group has an important interest in protecting the health and safety of attendees, and welfare of those who participate in its meetings; and

WHEREAS, at its meeting December 1, 2021, the San Francisco Airport/Community Roundtable adopted, by unanimous vote, a resolution wherein the membership found, *inter alia*, that as a result of the continuing COVID-19 state of emergency, meeting in person would present imminent risks to the health or safety of attendees; and

WHEREAS, The San Francisco Airport/Community Roundtable has not met since its regular meeting in December 1, 2021; and

WHEREAS, the membership has reconsidered the circumstances of the state of emergency and finds that the state of emergency continues to impact the ability of members of the Roundtable to meet in person because there is a continuing threat of COVID-19 to the community, and because membership meetings have characteristics that give rise to risks to health and safety of meeting participants (such as the increased mixing associated with bringing people together from across the community); and

WHEREAS, in the interest of public health and safety, as affected by the emergency caused by the spread of COVID-19, the membership deems it necessary to find that meeting in-person would present imminent risks to the health an safety of attendees, and thus intends to invoke the provisions of AB 361 related to teleconferencing;

NOW, THEREFORE, IT IS HEREBY DETERMINED AND ORDERED that

1. The recitals set forth above are true and correct.
2. The Technical Working Group finds that meeting in person would present imminent risks to the health or safety of attendees.
3. Staff is directed to return no later than thirty (30) days after the adoption of this resolution or at their next regular meeting to consider making the findings required by AB 361 in order to continue meeting under its provisions.
4. Staff is directed to take such other necessary or appropriate actions to implement the intent and purposes of this resolution.

* * * * *

Adopted at the Technical Working Group of _____.

Ricardo Ortiz
Subcommittee Chairperson

Date

MEMORANDUM

To: Michele Rodriguez
SFO Community Roundtable Coordinator
County of San Mateo
400 County Center
Redwood City, CA 94063

From: Sarah C. Yenson, Senior Consultant
Eugene M. Reindel, Director

Date: January 10, 2022

Subject: Review of SFO GLS Innovative Approach Procedures, Groups A-C, E

Reference: HMMH Project Number 312310

HMMH reviewed the following nine draft GLS Innovative Approach Procedures for San Francisco International Airport (SFO) as per the request received on November 17, 2021.

- Group A (DBAYY): GLS-DB 28R
- Group B (Bridge Visual): GLS-BV, GLS-BVE
- Group B (Tipp Toe Visual): GLS-TT 28L, GLS-TT 28R
- Group C: GLS-R (EDDY), GLS-R (ARCHI)
- Group E (STINS): GLS-A 10L, GLS-A 10R

The intent of our review was to affirm the Airport's conclusion that no change to noise levels would be expected due to these proposed GLS approach procedures, and to identify any potential ideas for further noise reductions on the proposed procedures. For this assessment, HMMH reviewed the GBAS Innovative Approach Procedures documentation provided on SFO's noise website (<https://noise.flysfo.com/2021/05/14/gbas-innovative-approach-procedures/>), as well as existing aviation sectional maps and satellite imagery for reference.

The review of potential modifications and the resulting potential options are products of a basic review of FAA instrument procedure design and population centers. HMMH did not perform a rigorous technical analysis for these recommendations, nor did we review aircraft performance characteristics or settings. Our review focused on the possible change in single-event noise levels from aircraft on the proposed procedures as compared to the existing procedures. As a rule of thumb, single-event noise levels that change by less than 1 dB are not perceptible, single-event noise levels that change between 1 and 3 dB are barely noticeable, changes of 3 to 5 dB are generally noticeable, and changes of greater than 5 dB are quite noticeable and can be perceived as twice as loud or half as loud. HMMH accepts any change of less than 1 dB as being no perceptible change. A shifting of noise may occur when a flight path is moved laterally, so our review also included assessment of potential lateral shifts in the proposed procedures.

Group A (DBAYY): GLS-DB 28R

The GLS-DB 28R proposed approach replicates and proceduralizes vectors typically issued by air traffic controllers (ATC) for aircraft arriving from the north to the RNAV Y GPS approach to Runway 28R. From the CEPIN waypoint inbound, the approach is the same as the existing GLS-A approach to 28R. As this approach is an overlay of flight paths currently in use, HMMH concurs that, based on the information provided in the GBAS Innovative Approach Procedures documentation, there likely would be no change in noise level from the existing procedure. Due to traffic operating at Oakland International Airport, no SFO traffic is vectored north or northeast of the proposed GBAS2 waypoint, resulting in most of the noise remaining primarily over the San Francisco Bay.

Given the altitudes of the proposed procedure outside of WP15, further increases in altitude would not likely be feasible. We considered the option of reducing the leg length between CEPIN and AXMUL to shift the noise contour farther north; however, this would likely increase the population within the 60 dB contour. This would also

result in a discrepancy between the existing GLS-A approach and this proposed approach. Therefore, we do not have any suggestions at this time to provide additional noise reductions for the proposed procedure.

Group B (Bridge Visual): GLS-BV 28R (ARCHI), GLS-BVE 28R (EDDY)

The GLS-BV 28R from ARCHI and the GLS-BVE 28R from EDDY replicate and proceduralize the existing Bridge Visual approach, which is managed and used by a specific airline and must be specifically requested from ATC. Based on the information provided in the GBAS Innovative Approach Procedures documentation and the knowledge that this is a replication of an existing procedure, HMMH concurs that no change in noise levels would be expected through the implementation of this proposed procedure. The documentation for these new procedures indicates the expected number of operations for this procedure; however, the current level of traffic was not indicated for the Bridge Visual and the resulting difference in the current number of operations and the expected number of operations for the proposed approach is unclear.

Regarding modifications to these proposed approaches for noise reduction purposes, shifting the GLS-BVE 28R EDDY flight path would not likely significantly change the affected population since the areas to either side of the proposed flight path do not indicate obvious areas for benefit (e.g., industrial or less-populated areas). We considered the potential for an increase in altitude at EDDY; however, the proposed approach's descent gradient between EDDY and GOYBE is 318 feet per nautical mile (ft/nmi, which is the maximum standard descent gradient below 10,000 feet above Mean Sea Level (MSL));¹ thus, an increase in altitude at EDDY would not be feasible. Additionally, altitude restrictions limit the maximum altitude at EDDY to 6,000 ft MSL, which is the altitude proposed in this procedure.

For the GLS-BV 28R ARCHI, the descent gradient between ARCHI and TRDOW is approximately 200 ft/nmi, but the proposed altitude at ARCHI is 7,000 ft MSL, which is the maximum allowable altitude at that waypoint. Therefore, an increase at ARCHI would not be feasible either.

HMMH was unable to identify any beneficial lateral shifts to the waypoints. Relocation of the first segments of either procedure would be the feasible segments for lateral shifts; however, such shifts would merely relocate noise over different communities (shifting of noise), and, in the case of EDDY, likely increase the number of people affected by the resulting noise.

Group B (Tipp Toe Visual): GLS-TT 28L (EDDY), GLS-TT 28R (ARCHI)

The GLS-TT 28L from EDDY and GLS-TT 28R from ARCHI replicate and proceduralize the existing Tipp Toe Visual approach to 28L/R. These proposed procedures vary slightly with the locations of the new waypoints and the missed approach procedures, but both align with the existing procedure. Since they align with existing procedures, HMMH concurs that no change to noise levels would occur for either proposed procedure.

Regarding possible modifications to the proposed procedures for noise reduction purposes, the descent gradient between EDDY and SIDBY is approximately 212 ft/nmi; however, EDDY is restricted to a maximum altitude of 6,000 ft MSL. As the proposed procedure uses 6,000 ft MSL at EDDY, a higher altitude and steeper descent gradient cannot be implemented.

Another option could be to relocate the proposed waypoints SF795 and SF771 over the water, which would shift the noise contour farther from populated areas to the west. However, these options do not account for interactions with area traffic and a more detailed assessment of the area traffic patterns and volume would be required and coordination with the FAA would be needed.

¹ Federal Aviation Administration Order 8260.3E, *United States Standard for Terminal Instrument Procedures (TERPS)*, September 17, 2020. Accessed December 9, 2021.

Group C: GLS-R 28R (ARCHI), GLS-R 28R (EDDYY)

The GLS-R 28R from ARCHI and the GLS-R 28R from EDDYY are both close overlays of the existing RNAV Y approach to 28R, though the proposed procedures have a shorter final approach segment. The ARCHI procedure also has an altitude increase at SIDBY.

Based on the information available in the GBAS Innovative Approach Procedures documentation, HMMH concurs that no perceptible change in noise levels would result from the proposed GLS-28R from ARCHI. The documentation shows the potential for an incremental increase (up to 0.04 dB) at ARCHI and an incremental decrease (up to 0.14 dB) at DONNG; however, as noted above, such small changes are imperceptible to the human ear. Possible beneficial changes to the noise contour produced by the GLS-R 28R from EDDYY may occur due to the increased altitude at SIDBY. The documentation for the GLS-R 28R at EDDYY shows the potential for an incremental decrease at EDDYY (up to 0.86 dB) and a more substantial decrease at SIDBY (up to 6.04 dB), with the most significant noise reduction occurring for the Widebody 1 case.

Regarding lateral path changes and potential benefits from such a shift, the area around the proposed overland segments for the GLS-R 28R EDDYY consists of populated areas and lateral shifts would simply shift the noise burden between communities. The area around the GLS-R 28R ARCHI is generally industrial/commercial, so shifting its lateral path would also not necessarily provide any benefit to the communities.

With respect to altitudes, as with the GLS-TT proposed procedures, the descent gradients for both initial segments from EDDYY and ARCHI are less than the maximum allowable gradient. However, altitudes at EDDYY and ARCHI are limited to a maximum of 6,000 ft MSL and 7,000 ft MSL, respectively; as the altitudes at these waypoints are already at the maximum, an increased descent gradient is not feasible.

Group E: GLS-A 10L, GLS-A 10R

The GLS-A proposed procedures to 10L and 10R are similar to the existing RNAV Y 10L and 10R procedures, though the final approach path is located slightly north of the runway centerlines. Both also provide increased altitudes at the point the paths first cross the coastline to the north.

According to the data provided in the GBAS Innovative Approach Procedures documentation, HMMH would expect that the noise would shift to the north in conjunction with the flight track shift. The documentation indicates that there is the potential for a decrease in noise (up to 2.89 dB) at NM4 and an increase in noise (up to 2.56 dB) at NM6. As mentioned above, changes between 1 and 3 dB are generally barely noticeable to the human ear. Additionally, this procedure's use is limited to unusual wind conditions that occur on the order of one hour per year, as specified in the documentation, so we expect that no change in noise levels would occur from these proposed procedures. The current procedures for Runway 10L/R have significant rates of go-around operations and the implementation of precision procedures is likely to reduce the go-around rate, which in turn would reduce average daily noise levels.

Regarding potential changes, neither lateral nor vertical modifications are advisable for this procedure since the region which would be most affected is within approximately six nautical miles of the runway approach end. At this point, aircraft require stability in both the vertical and lateral paths to ensure a safe approach and landing and any changes to the procedure would likely detract from this aim.

Summary

HMMH concurs with the assessments regarding the single-event noise levels associated with the analyses for the nine proposed GBAS approach procedures in this document. The documentation for these procedures does not capture the expected change usage from the existing procedures to the proposed GBAS procedures. If the expected usage of the procedure goes up as a result of GBAS implementation, the cumulative exposure may increase. We do not believe this is an expectation on any of the procedures we evaluated.

Regarding possible modifications to the procedures, HMMH considered some options that could possibly reduce noise levels, including increased altitudes and/or descent gradients and lateral waypoint shifts. However, where proposals for higher altitudes and increased descent gradients could be feasible, they were precluded by altitude

restrictions at EDDYY and ARCHI. We also considered lateral shifts for some waypoints. In several cases, such shifts would merely relocate noise to other communities, with the overall changes expected to be neutral or non-beneficial (no change or increase in affected population).

However, we identified two possible areas of inquiry: shortening two legs on the GLS-DB 28R (the CEPIN to AXMUL leg and the GBAS to WP15 leg) (GLS-DB 28R) and shifting SF795 and SF 771 farther over water for the GLS-TT 28L and 28R procedures. Both suggestions would shift noise over the water and away from populated areas. These suggestions have not undergone any rigorous technical analysis and would need to be reviewed in greater detail and discussed with the FAA and other stakeholders before being put forth as recommendations.

HMMH suggests that the SFO Roundtable support the implementation of the nine GLS Innovative Approach Procedures discussed in this document. This suggestion does not depend on the implementation or investigation of the two potential areas of inquiry identified above, as HMMH agrees that no change to single-event noise levels would result from the establishment of the GLS-DB or GLS-TT procedures.

Review of Proposed GLS Innovative Approach Procedures at SFO

January 18, 2022

Agenda

- Background
- Methodology
- Procedure Group Assessments
 - Noise
 - Potential Modifications
- Summary



Background

- Per request of SFO Roundtable, HMMH reviewed nine (9) proposed GLS Innovative Approach Procedures at SFO
 - Group A: DBAYY Runway 28R (1)
 - Group B: Bridge Visual and Tipp Toe Visual (4)
 - Group C: GLS-R (2)
 - Group E: GLS-A Runway 10L/R (2)
- Purpose of review
 - Affirm the Airport's assertions regarding changes to noise
 - Identify potential procedural changes that could provide further noise reductions
 - Advise Roundtable on procedure acceptance



Review Methodology

- Conducted a basic review using
 - GBAS Innovative Approach Procedure documentation from Airport website
 - Satellite imagery and estimated population centers
 - Aviation sectional charts and instrument procedure charts
 - Additional documentation from Airport
- Noise may shift when flight paths move laterally, so this review included assessments of lateral shifts as proposed in the procedures.
- We did not conduct a rigorous technical review nor an analysis of aircraft performance characteristics or procedures.
- This review focused on the possible change in single-event noise levels from aircraft on the proposed procedures as compared to the existing procedures.

Generally, changes to single-event noise levels are perceptible to the ear as follows:

- < 1 dB: not perceptible
- 1 – 3 dB: barely noticeable
- 3 – 5 dB: noticeable
- > 5 dB: very noticeable; usually experienced as twice as loud or half as loud
- HMMH considers changes of < 1 dB as no perceptible change.

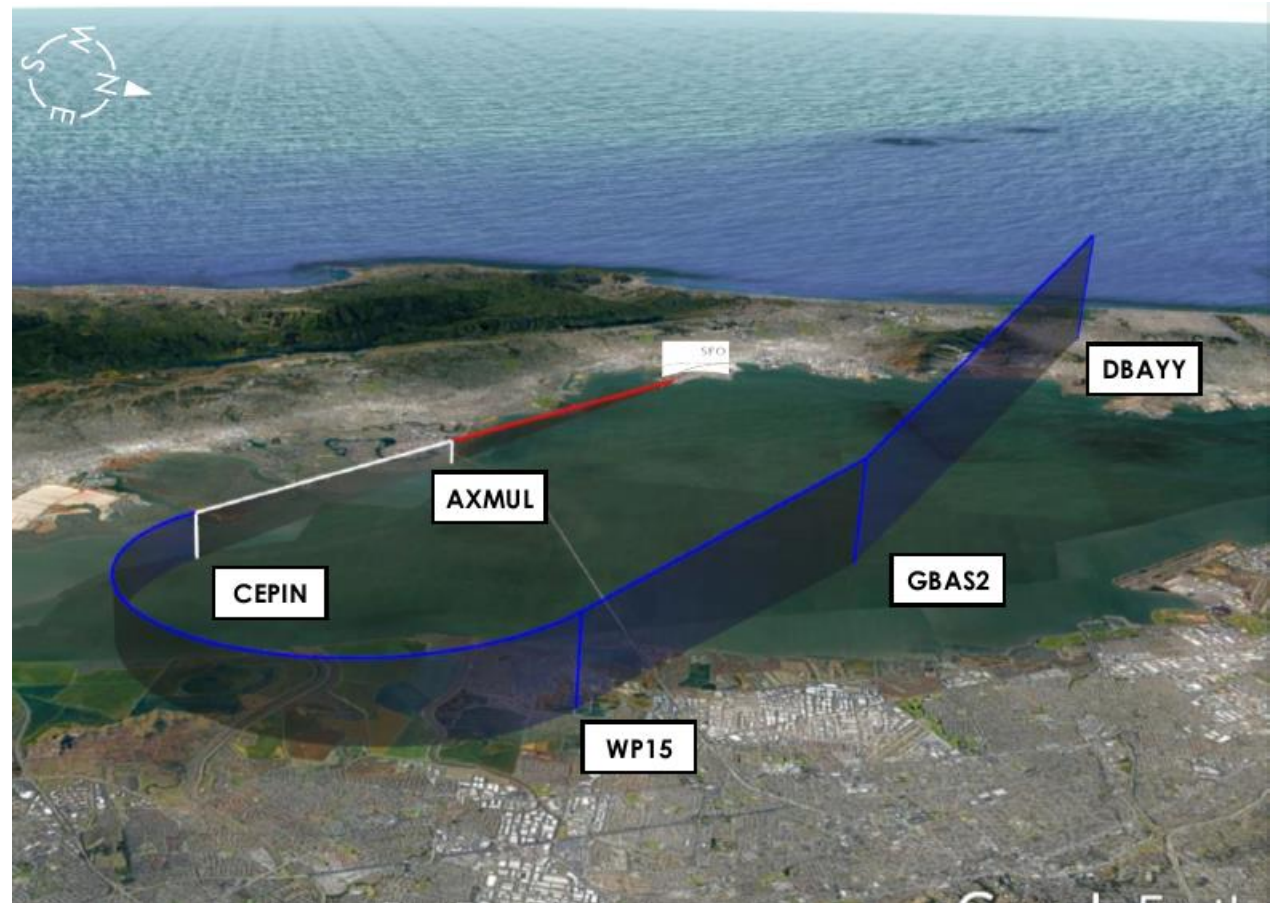
Potential Modifications for Noise Reduction

- Altitude modifications
 - When possible, considered raising altitudes to use maximum standard descent gradient
 - Limited by altitude restrictions at EDDYY (6,000 ft MSL) and ARCHI (7,000 ft MSL)
- Path modifications
 - Considered lateral shifts with respect to populated areas

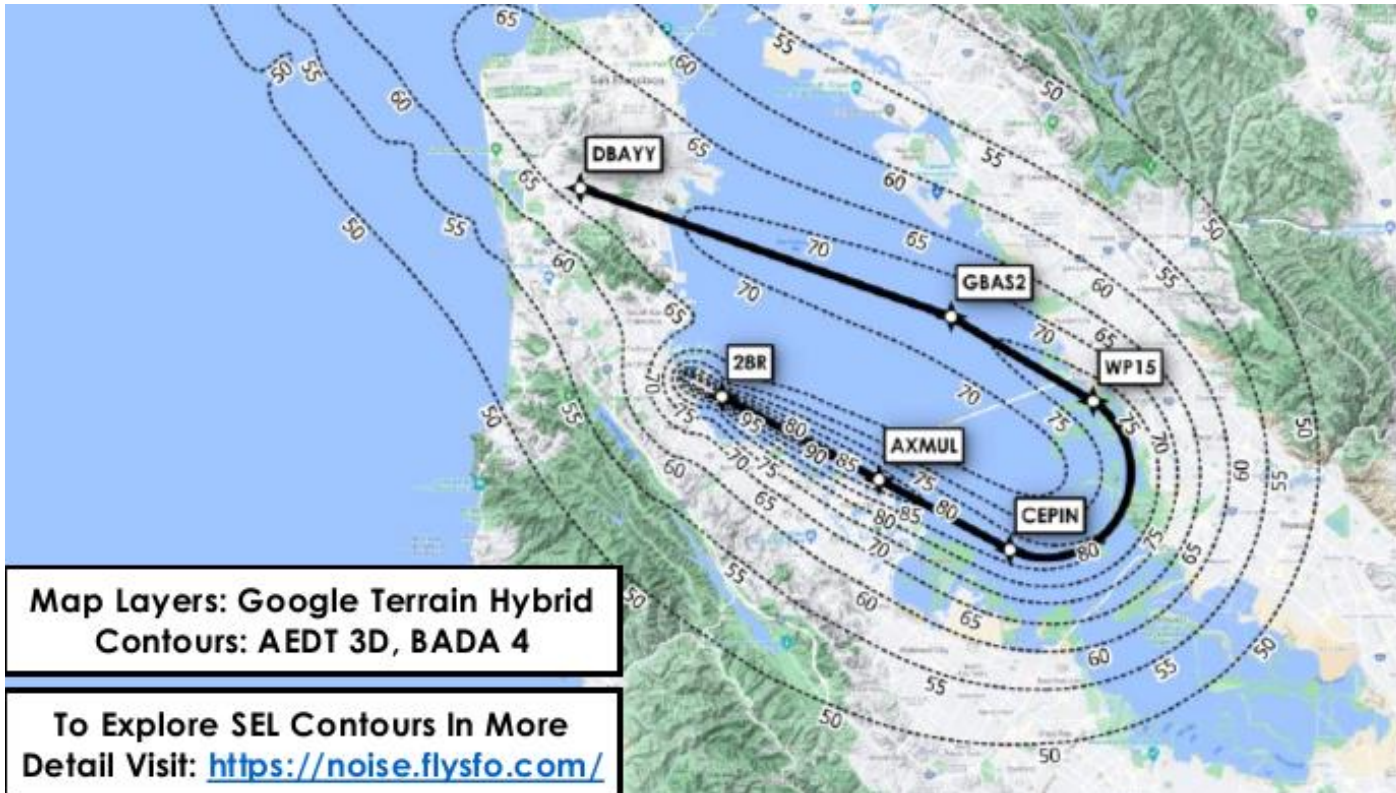


Group A: GLS-DB 28R (DBAYY)

- Proceduralizes vectors issued by ATC for aircraft arriving from the north to the RNAV Z GPS to Runway 28R.
- Due to Oakland traffic, no traffic is vectored north or northeast of GBAS2
- No change in current single-event noise levels would be expected



Group A GLS-DB 28R Potential Modifications



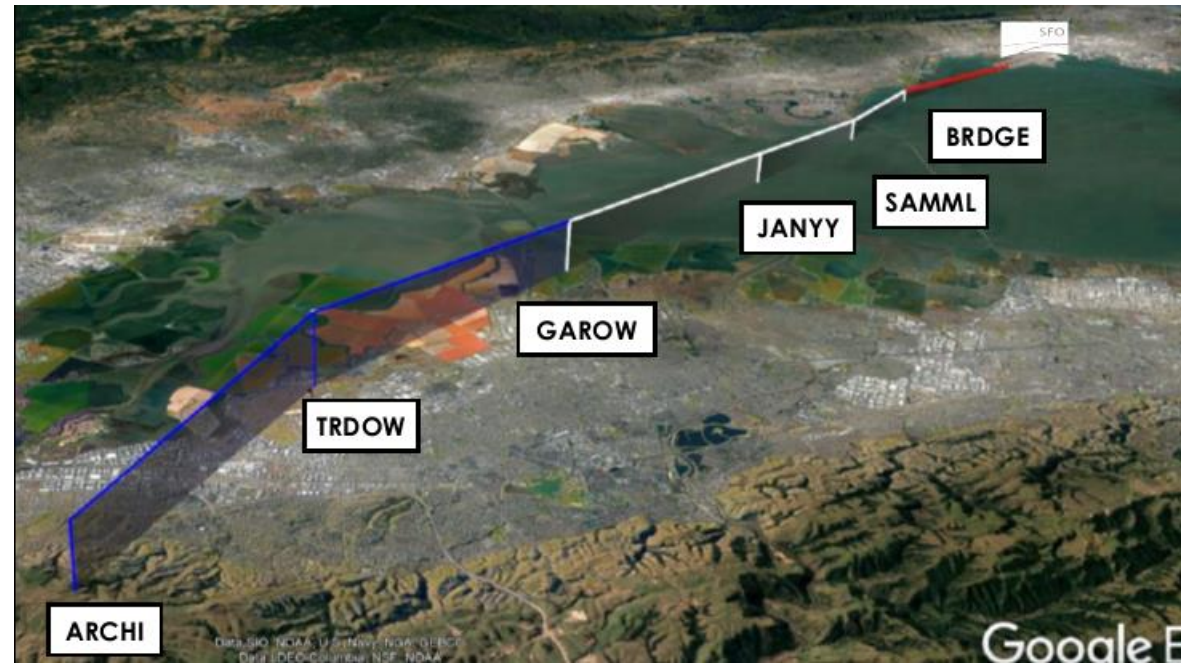
- No feasible recommendations at this time
- GLS-DB 28R procedure altitudes are already high
 - Procedure begins at 11,000 ft MSL at DBAYY
 - 5,500 ft MSL at WP 15 prior to starting inbound turn
 - Likely unable to raise altitudes on final approach
- Considered shortening leg lengths for CEPIN-AXMUL and GBAS2-WP15
 - Results in discrepancy with existing GLS-A procedure
 - Not clear if aircraft would be able to achieve descent gradient
 - Noise would shift to different communities

Group B: GLS-BV/BVE 28R (Bridge Visual)

- These two approaches proceduralize the existing Bridge Visual approach
 - The Bridge Visual is not published and must be specifically requested from controller
- No change in current single-event noise levels would be expected
- One concern is the change in procedure usage
 - Since the Bridge Visual is not published, the publication of the GLS-BV/BVE procedures may result in more aircraft flying over the area
 - Airport documentation does not provide sufficient data to determine the expected operational change



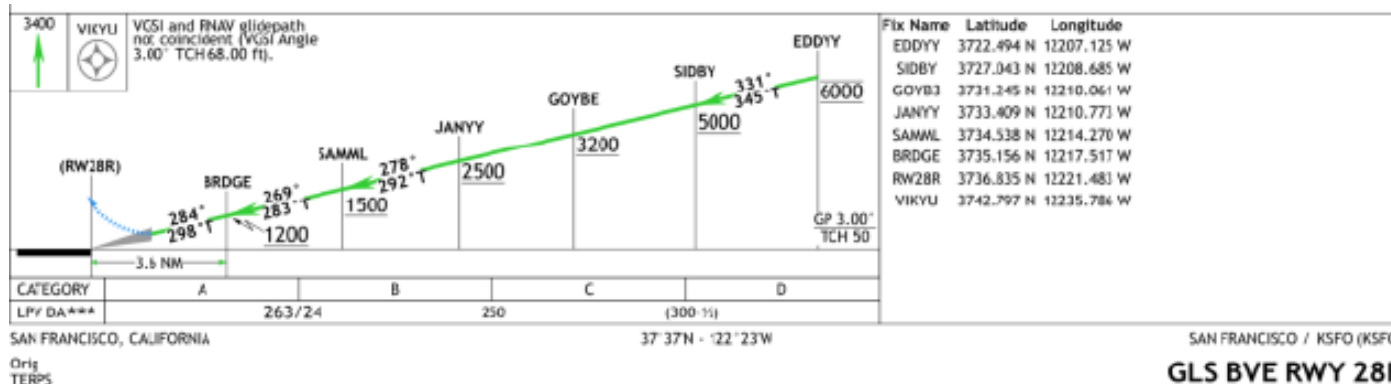
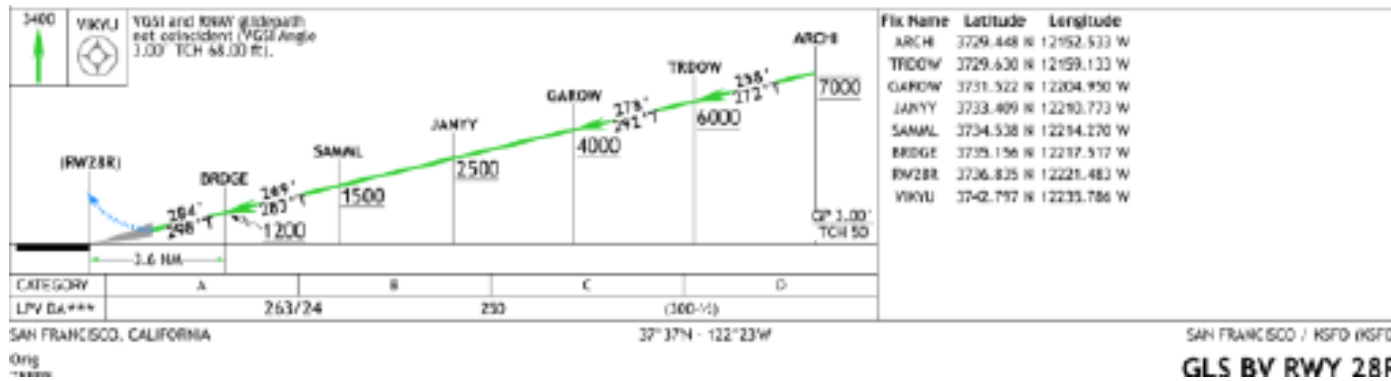
GLS-BVE



GLS-BV

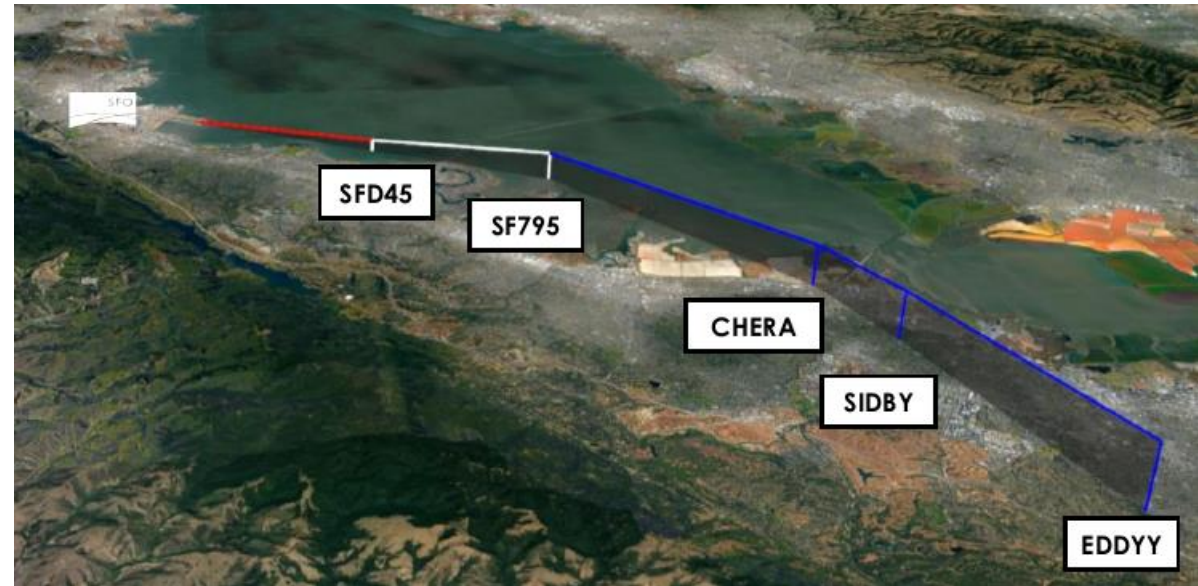
Group B: GLS-BV/BVE 28R Potential Modifications

- No feasible recommendations at this time
- No feasible altitude changes for EDDYY transition
 - EDDYY-GOYBE uses maximum standard descent gradient already
 - Proposed EDDYY restriction at 6,000 ft, which is also maximum allowable altitude
- No feasible altitude changes for ARCHI transition
 - Proposed ARCHI restriction at 7,000 ft, which is maximum allowable altitude
- Relocating flight paths would shift noise to different communities
 - For EDDYY transition, the feasible shift would likely increase the population exposed to noise



Group B: GLS-TT 28R (Tipp Toe Visual)

- These two approaches proceduralize the existing Tipp Toe approach
- No change in current single-event noise levels would be expected



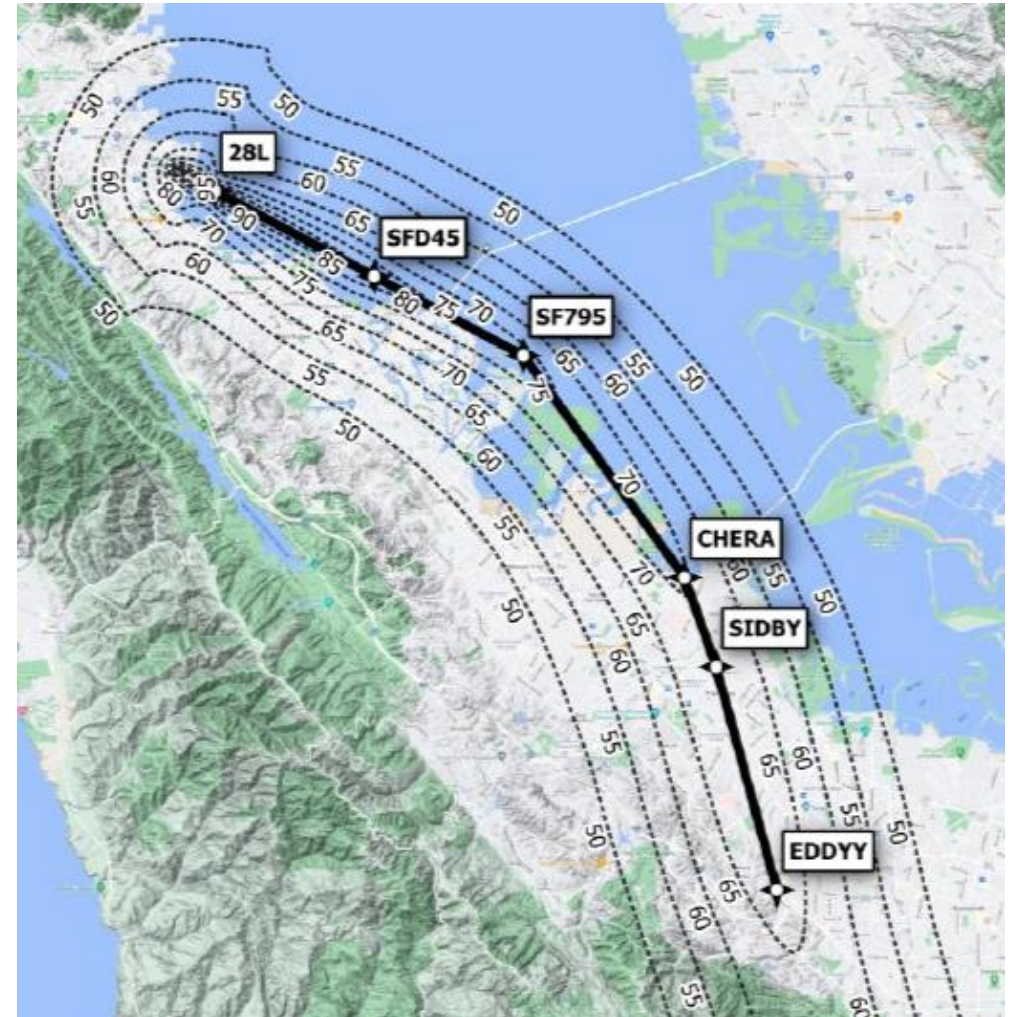
GLS-TT 28L



GLS-TT 28R

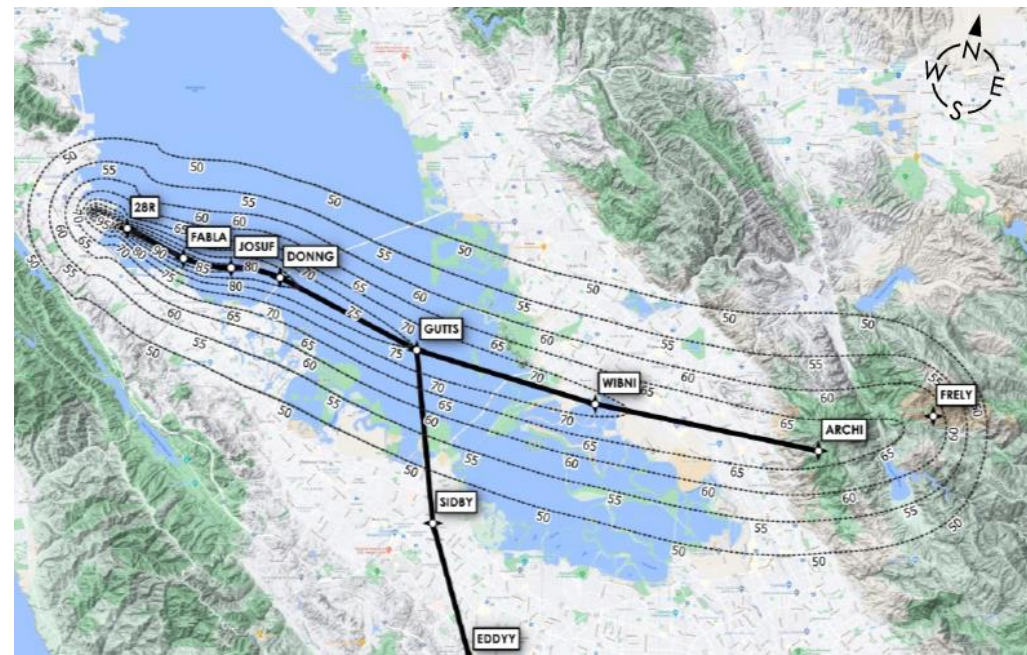
Group B: GLS-TT 28L/R Potential Modifications

- No feasible altitude changes, but possibility of lateral shift
- Potential to shift SF795 (28L) and SF771 (28R) over the water
 - Analysis does not account for interactions with traffic at other airports or other SFO traffic
 - Would require discussion with the FAA
- Considered altitude change for EDDYY to SIDBY
 - Proposed EDDYY restriction at 6,000 ft, which is also maximum allowable altitude
 - Descent gradients on other procedure segments already at maximum standard gradient

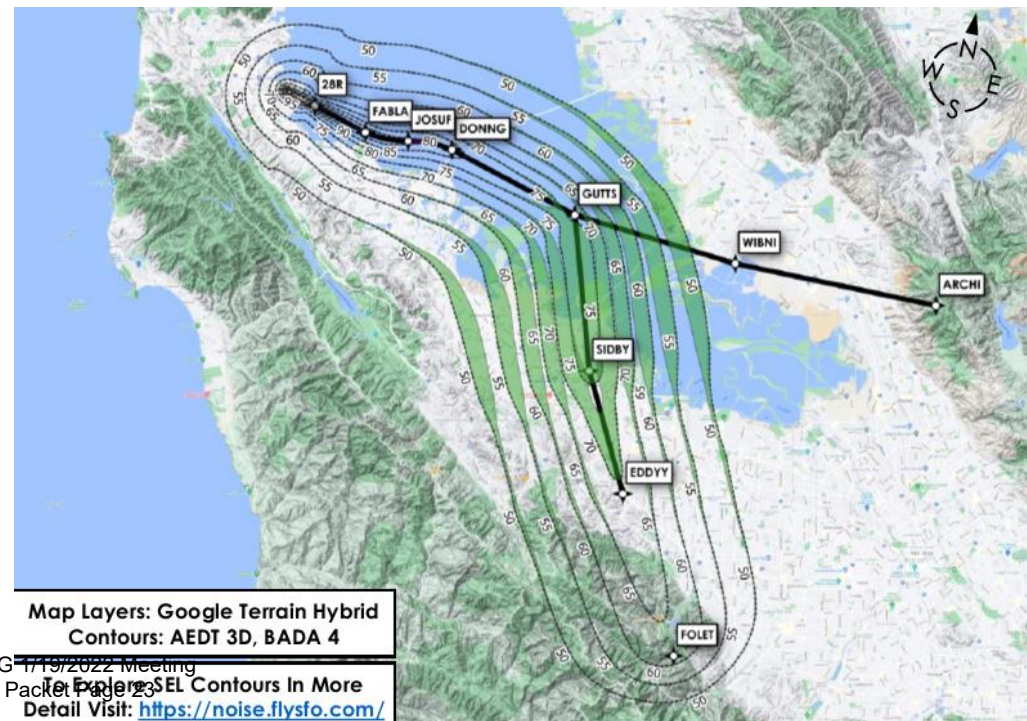


Group C: GLS-R 28R (ARCHI and EDDYY)

- These two approaches are very similar to the existing GPS Y to Runway 28R
 - Both final approach segments are slightly shorter
 - Increase in elevation at SIDBY for the EDDYY transition
- Potential for reduction in single-event noise between SIDBY and GUTTS
 - ARCHI:
 - Incremental increase (≤ 0.04 dB) at ARCHI
 - Incremental decrease (≤ 0.14 dB) at DONNG
 - EDDYY:
 - Incremental decrease (≤ 0.86 dB) at EDDYY
 - Decrease at SIDBY (≤ 6.04 dB)



GLS-R 28R ARCHI
Widebody 1



GLS-R 28R EDDYY
Widebody 1

Map Layers: Google Terrain Hybrid
Contours: AEDT 3D, BADA 4

TWG 1/19/2022 Meeting
Packet Page 23
Detail Visit: <https://noise.flysfo.com/>

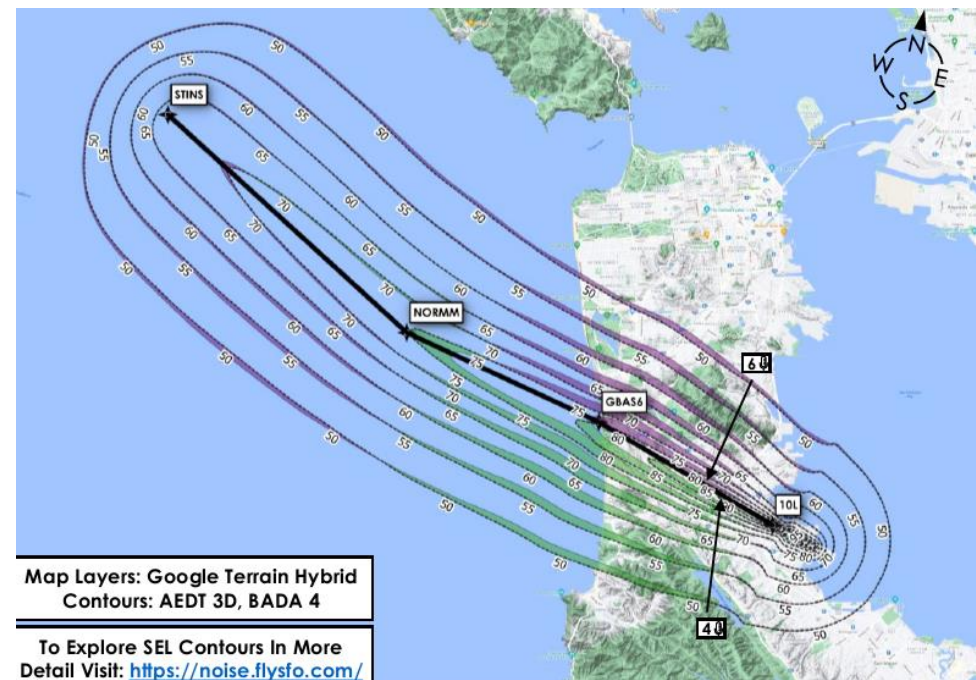
Group C: GLS-R 28R

Potential Modifications

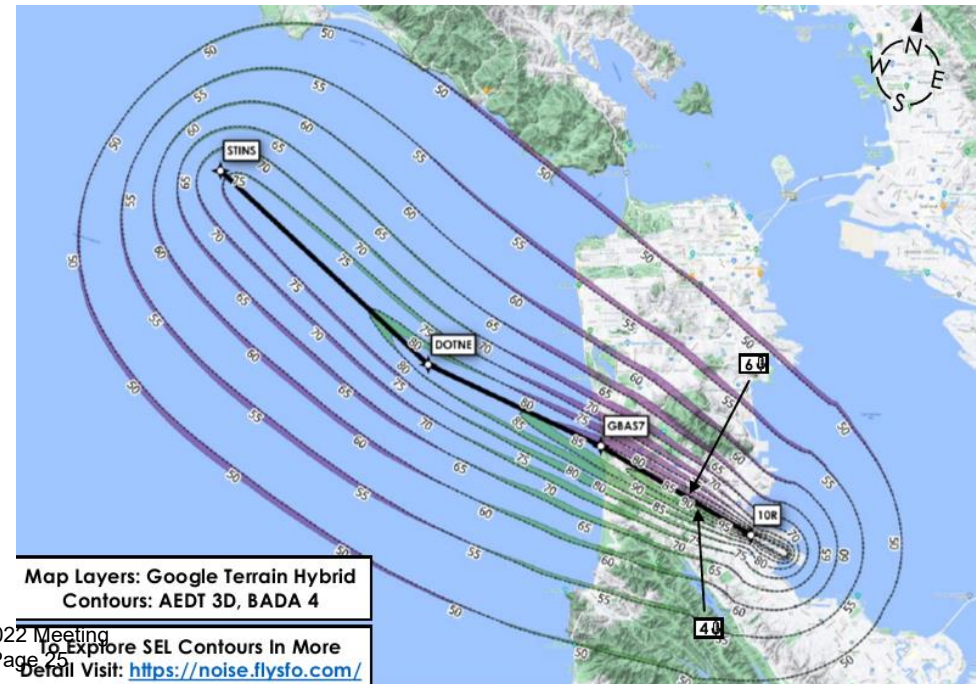
- No feasible recommendations at this time
- No feasible altitude changes
 - Proposed EDDYY and ARCHI restrictions are already at maximum altitudes
 - Other segments at maximum standard gradient and/or not easily modified since they are on the final approach segment
- Relocating flight paths would shift noise to different communities
 - For EDDYY transition, the feasible shift would likely increase the population exposed to noise
 - ARCHI transition currently over and surrounded by industrial (non-noise sensitive) areas

Group E: GLS-A 10L/R

- These two approaches are similar to the existing RNAV Y to Runway 10L/R
 - Final approach path is slightly to the north of runway centerline
- Noise would be expected to shift north with the final approach path
 - Potential for decrease ≤ 2.89 dB at 4 NM from runway approach end
 - Potential for increase ≤ 2.56 dB at 6 NM from runway approach end
- Expected improvements to safety with implementation of these procedures
- Procedure use expected to be low
 - Runway 10L/R averages use for about 1h annually

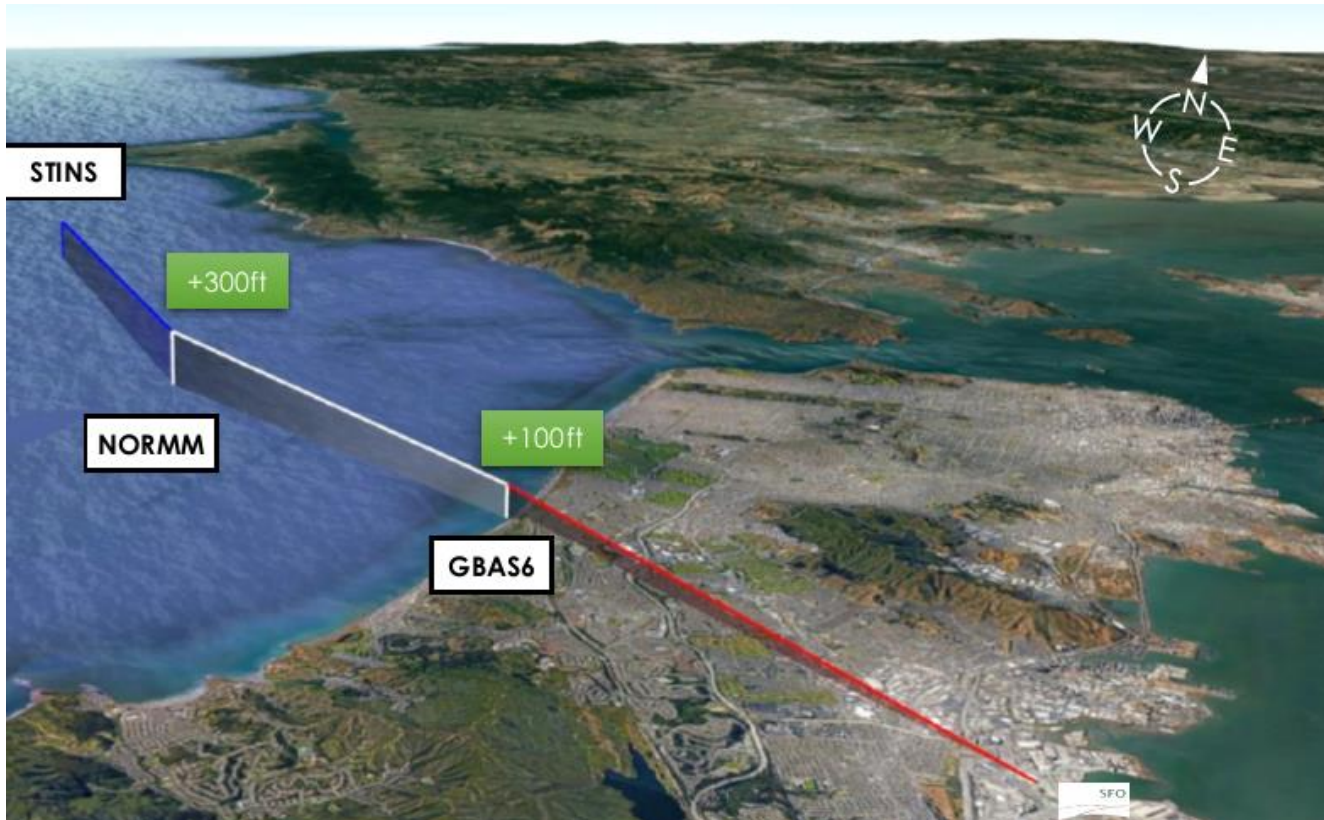


GLS-A 10L
Widebody 1



GLS-A 10R
Widebody 2

Group E: GLS-A 10L/R Potential Modifications



- No feasible recommendations at this time
- Area where changes would be most impactful is on final approach segment
 - Aircraft need to be on stable straight-in approach at this point
 - Changes to heading and rapid descents are not advisable in this area
- Proposed flight path is also shortest distance to airport

Summary

- HMMH agrees with Airport's conclusions regarding expected changes to noise as a result of the proposed Innovative GLS Approach Procedures
- We suggest the Roundtable support the Airport's implementation of the following GBAS procedures:
 - Group A: DBAYY Runway 28R (1)
 - Group B: Bridge Visual and Tipp Toe Visual (4)
 - Group C: GLS-R (2)
 - Group E: GLS-A Runway 10L/R (2)
- Recommendation to support the implementation of Group B: Tipp Toe is not dependent on the inclusion of the suggested modifications to waypoint location



Note: Only Group E: GLS-A Runway 10L/R procedures result in a noticeable change in single event noise levels. However, the Airport expects the use of the procedures to reduce missed approaches, which increases safety and reduces cumulative noise.

GLS Innovative Approach Procedure
documentation can be viewed at
[https://noise.flysfo.com/2021/05/14/gbas-
innovative-approach-procedures/](https://noise.flysfo.com/2021/05/14/gbas-innovative-approach-procedures/)





San Francisco International Airport

GBAS

San Francisco International Airport GBAS and GLS

SFO Roundtable Technical Working Group
January 18, 2021




Topics Covered

1. Current GBAS Project Timeline
2. Update to GLS-R Procedure and CFPP
3. Perspective on Visual Approach Utilization vs Instrument Approach Utilization
4. United Airlines Evaluation Flights
5. Portable Noise Measurement Report

For Community Evaluation Only - Not Intended for Navigation

GLS-R RWY 28R (EDDY)	Revision 2 Changes: Increased Altitude of DORNG to Match Current Procedure
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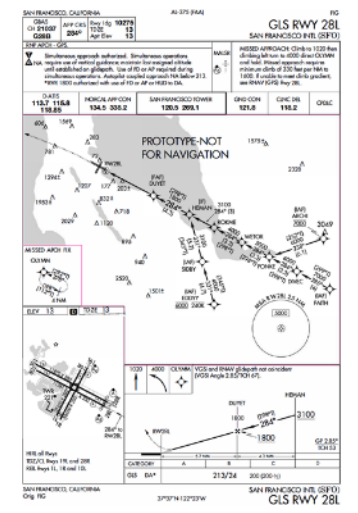
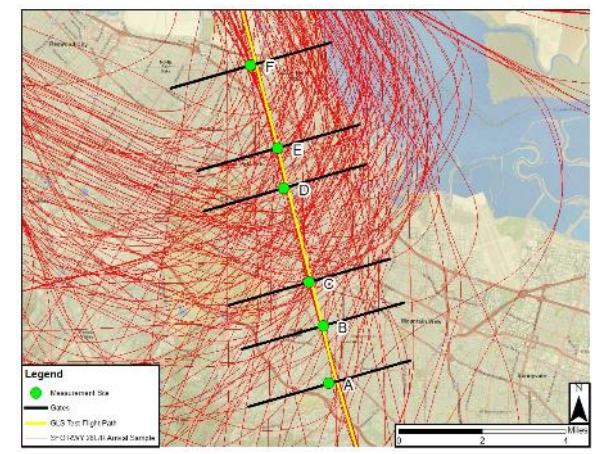
Google Earth

GLS Instrument approach to runway 28R originating southwest of the airport, starting at EDDY.

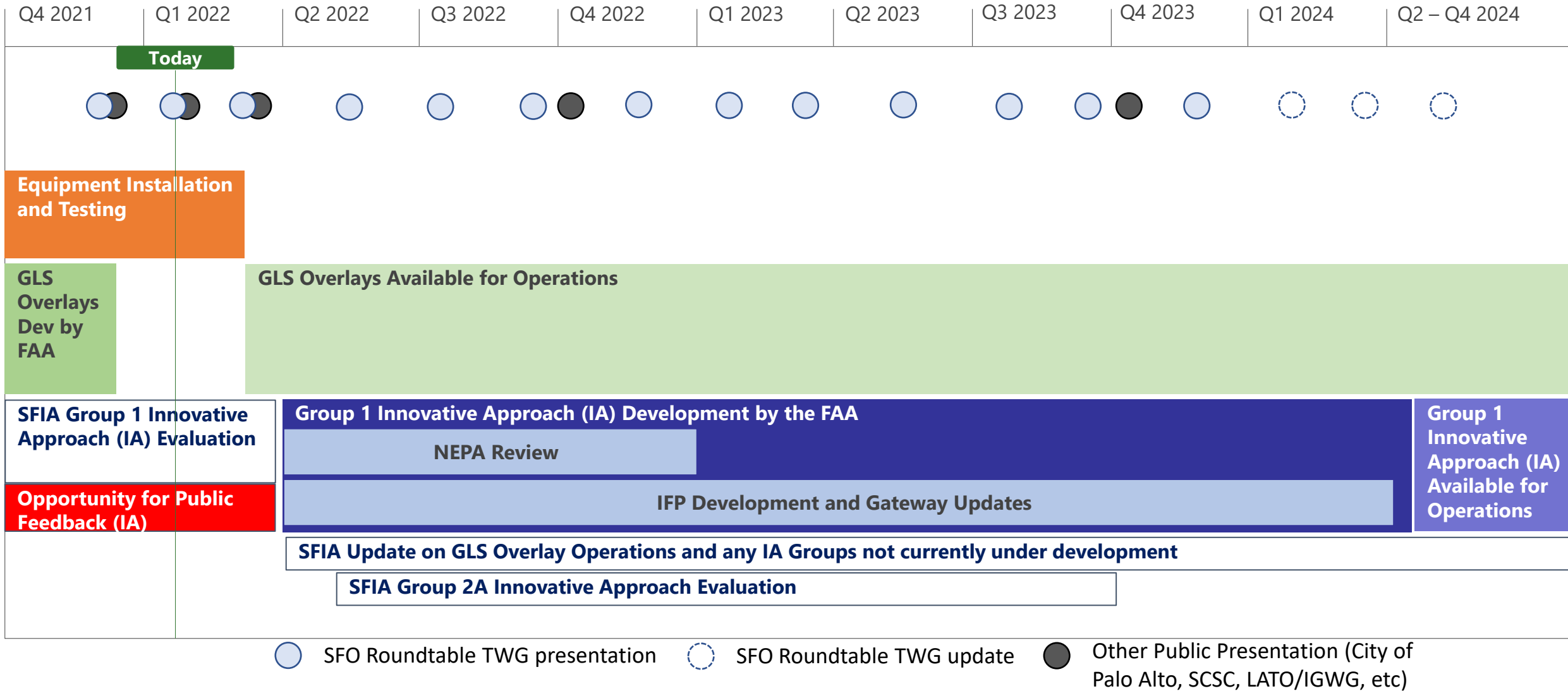
The approach is an overlay of the existing RNAV (RNP) Y RWY 28R. The GLS version of the approach would enable a higher altitude for aircraft crossing GRTS and shorten the final approach segment permitting RT turns overwater to occur prior to the GBAS portion of the approach.

Project Goals

- Noise Reduction
- ILS Redundancy
- Efficiency
- Reduce Delays



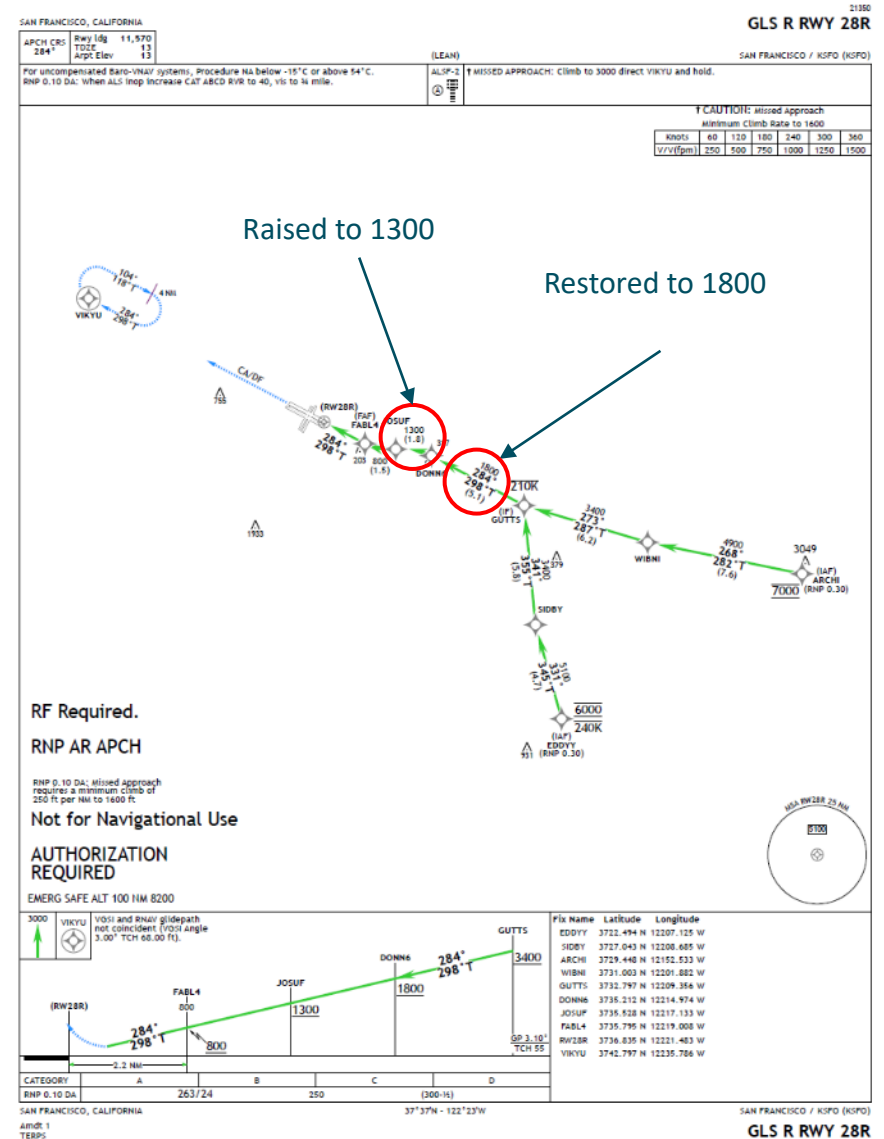
SFO GBAS Estimated Schedule and Planned Outreach



Update to Group 1 Innovative GLS-R Approach

GLS-R Update

- Both residents and members of the SFO Roundtable TWG provided feedback about the GLS-R Rev 1
 - Minimum altitude at DONNG should be increased to match or exceed existing altitudes
 - Minimum altitude at JOSUF should be increased to match or exceed existing altitudes
- SFIA GBAS Flight Procedures Subcommittee made small design tweaks and achieved altitude increases as depicted
- New CFPP (Rev 2) has been published on <https://noise.flysfo.com/2021/05/14/gbas-innovative-approach-procedures/>



Insight on Visual Approach Operations at SFO

SFO GBAS Project team has received several questions regarding the use of visual approach procedures at SFO from residents and the Roundtable TWG

Questions relate to the potential development of GLS versions of charted visual approach procedures and whether this might reduce dispersion of aircraft on approach into SFO

The GBAS Flight Procedures subcommittee spent some time in November and December discussing the questions from the community with the goal of providing additional insight

Insight on Visual Approach Operations at SFO

Possible Approach Types Under Visual Meteorological Conditions at SFO



	I.	II.	III.	IV.	V.
	Visual Approach	Charted Visual Approach (CVFP)	RNAV Visual (RVFP) and FMS Visual Approach	Instrument Approach (SIAP)	Circling/Sidestep Approach (SIAP)
SFO Procedure Examples	No Formal Route	Tipp Toe Quiet Bridge	RVFP Rwy 01R Bridge Visual 28R	ILS, RNAV, GLS	ILS, RNAV
Availability	Public	Public	US Airline Specific / OpSpec Special	Public	Public
Runways	All	28L/28R	28R, 01R	10L/28R, 10R/28L 19L/19R	Circling: 28L/28R, 1R/1L Sidestep: 28L/28R

Insight on Visual Approach Operations at SFO

1. FAA has published two Safety Alert for Operators (SAFOs 17010 and 21005) warning pilots about the risks associated with flying visual approaches **(I.)**
2. Both SAFOs were related to increasing safety concerns across the NAS, including incidents at SFO
3. FAA SAFOs encourage aircraft that have been cleared to fly a visual approach to consider requesting an instrument approach and/or to utilize all available navigational aids (including RNAV or the localizer) **(II., III. or IV.)**
4. Many international air carriers at SFO advise their pilots to request an instrument approach procedure, especially those operating widebody aircraft **(IV.)**
5. All domestic air carriers who are GBAS capable at SFO currently fly either a published instrument approach or an RNAV version of the charted visual approaches that produces little to no lateral dispersion **(III. or IV.)**
6. Non-GLS capable air carriers at SFO either accept a visual approach clearance, but use an instrument approach for enhanced guidance, or they will utilize one or more NAVAIDs on the Charted visual approach, reducing or eliminating lateral dispersion **(II. or IV.)**



Insight on Visual Approach Operations at SFO

Approach Types Used to 28L and 28R Under Visual Meteorological Conditions at SFO

	I.	II.	III.	IV.	V.
		Charted Visual Approach (CVFP)	FMS Visual Approach	Instrument Approach (SIAP)	
SFO Procedure Examples	No Formal Route	Tip Toe Quiet Bridge	Bridge Visual 28R	ILS, RNAV, GLS	ILS, RNAV
Method of Use	Public	RNAV (GPS) RNAV to LOC	RNAV (GPS)	RNAV (GPS), ILS	Circle to Land Sidestep
Likely Use	Training, Business Aviation or GA	Some US Air Carriers and GA	Some US Air Carriers	US Air Carriers All International	Training Or Construction

Insight on Visual Approach Operations at SFO

Approach Types Used to 28L and 28R Under Visual Meteorological Conditions at SFO with Group 1 IA GLS

	I.	II.	III.	IV.	V.
		Charted Visual Approach (CVFP)	FMS Visual Approach	Instrument Approach (SIAP)	
SFO Procedure Examples	No Formal Route	Tipp Toe, Quiet Bridge, <u>GLS-TT</u>	Bridge Visual 28R, <u>GLS-BV</u> and <u>GLS-BVE</u>	ILS, RNAV, GLS <u>GLS-R</u> , <u>GLS-A</u> , <u>GLS-DB</u>	ILS, RNAV
Method of Use	Public	RNAV (GPS), <u>GLS</u> RNAV to LOC	RNAV (GPS), <u>GLS</u>	RNAV (GPS), ILS, <u>GLS</u>	Circle to Land Sidestep
Likely Users	Training, Business Aviation or GA	<u>Some US Air Carriers and International</u>	<u>Some US Air Carriers and International</u>	<u>Few US Air Carriers and International</u>	Training, Winds Or Construction

Summary:

FAA is discouraging air carriers from flying visual approaches into SFO, and is encouraging operators to use published approaches (RNAV, ILS or GLS) whenever possible

Current dispersion experienced by residents is more directly related to vectors from Air Traffic and is not the result of visual approach operations

Introducing GLS approaches will not change the rate, or opportunity, for ATC vectoring



United Airlines conducted two series of approaches in support of the Group 1 Innovative GLS approach evaluation

Both flights were accomplished using a 737-MAX8 aircraft, flown by management pilots in close coordination with FAA SFO ATCT and NCT TMU

The first sequence of approaches occurred on the evening of 02DEC21 and the second occurred in the morning of 16DEC21

The UAL and FAA teams were able to execute 10 approaches total, 8 of which were flown over the portable noise monitors

Group 1 Innovative GLS Approach Evaluation with United Airlines



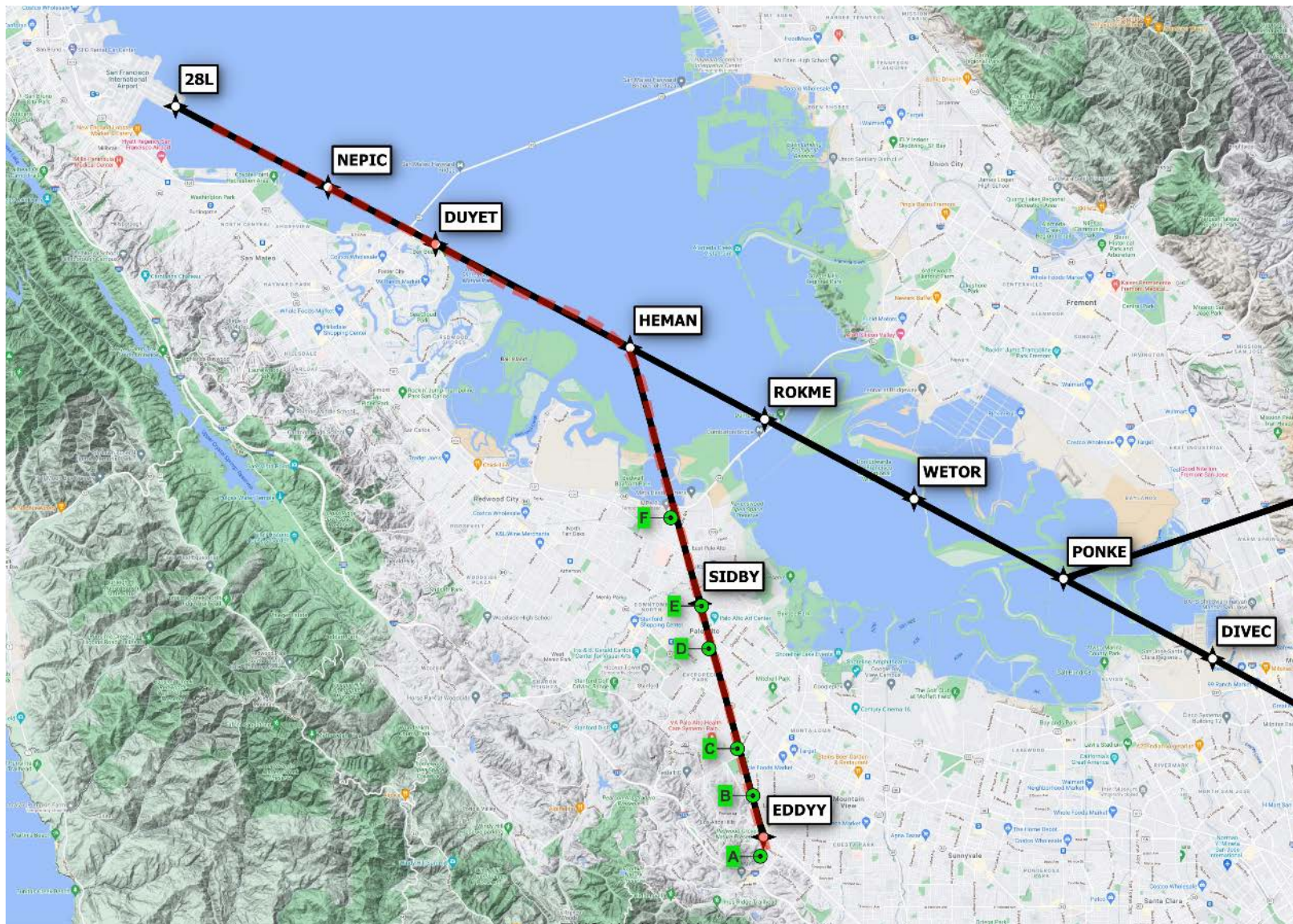
Measure Sound Near Downtown San Francisco

Measure Sound Near Noise Monitor Locations (A – F)

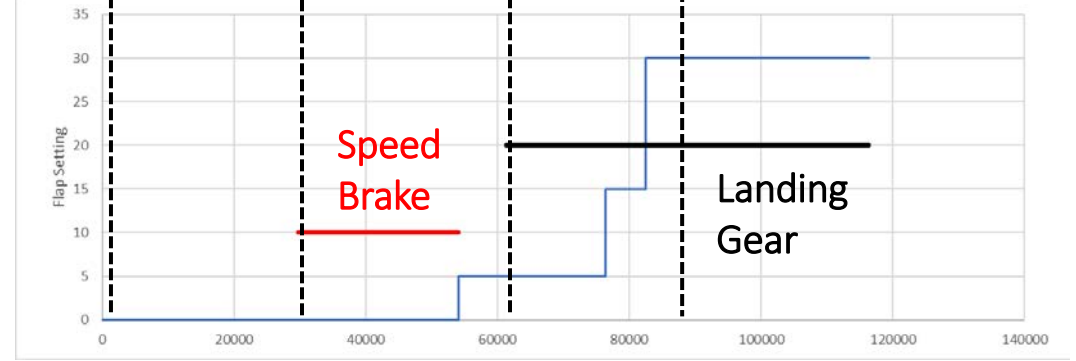
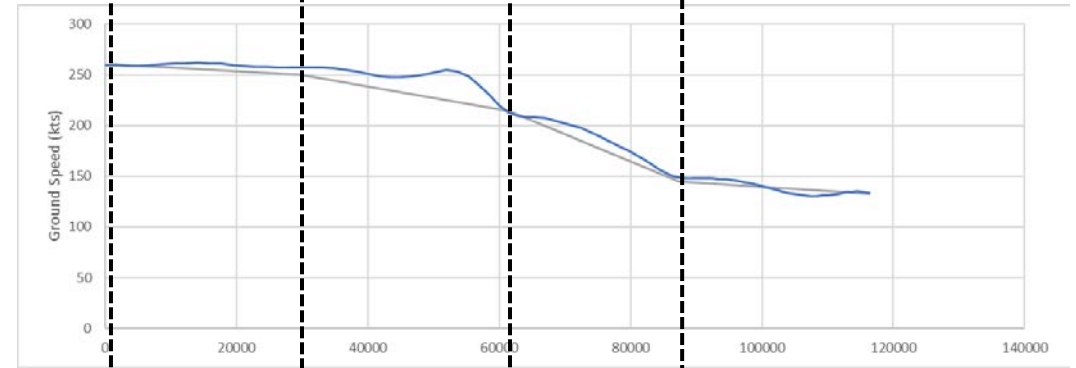
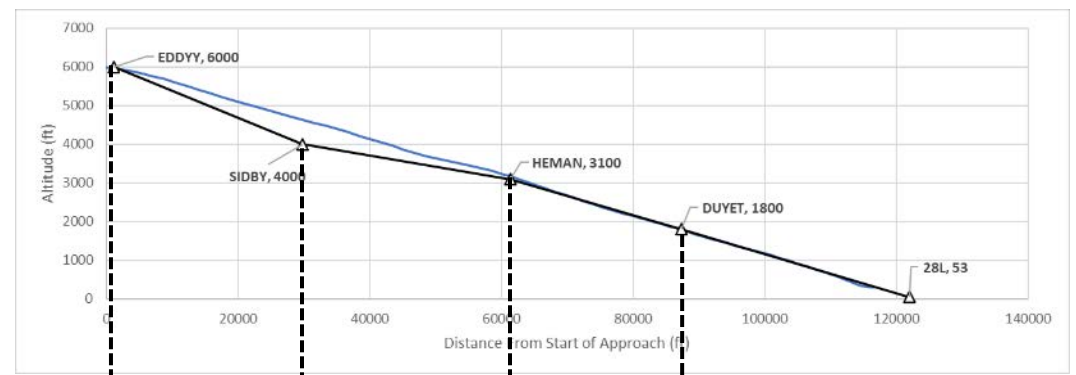
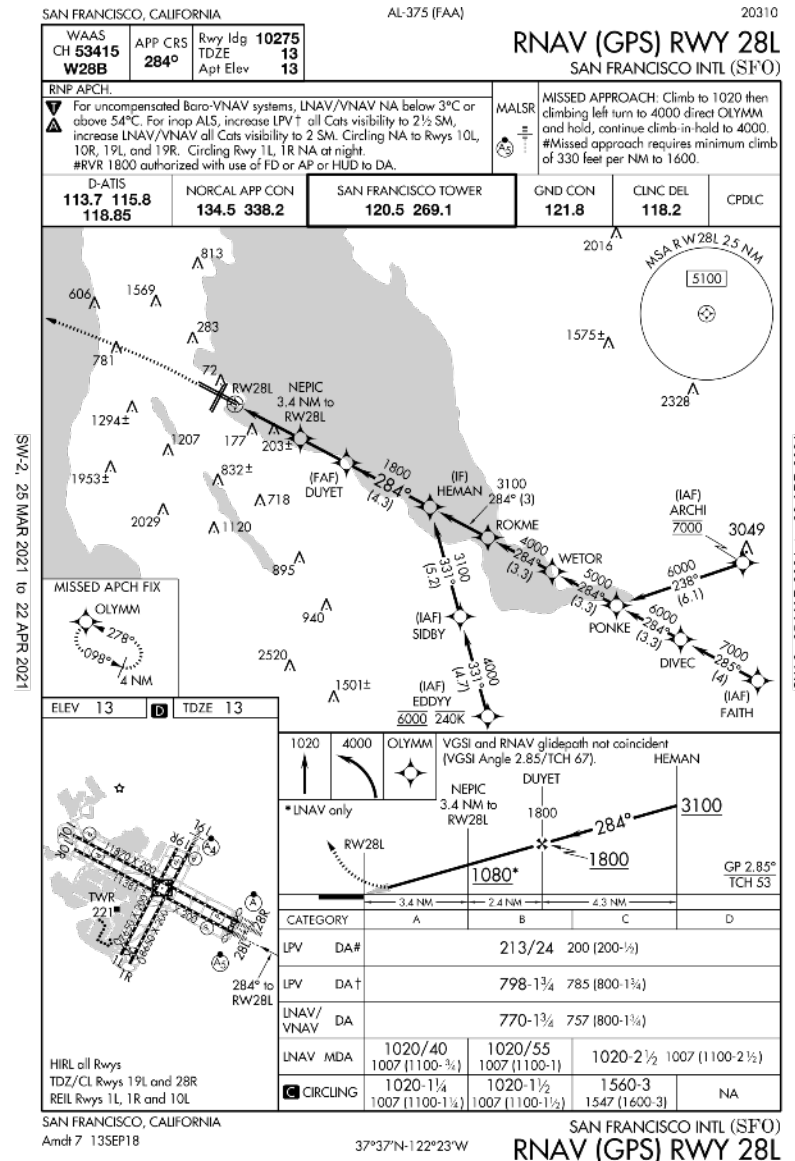
Measure Sound Near San Bruno Gap

Runway	Community Package	Approval Group	Submitted to IFP Gateway
28R ✓	GLS-DB Rwy 28R (DBAYY)	A	0 of 1
28R	GLS-BVE Rwy 28R (EDDYY)	B	0 of 3
28R	GLS-BV Rwy 28R (ARCHI)		
28L ✗	GLS-TT Rwy 28L (EDDYY)		
28R ✗	GLS-TT Rwy 28R (EDDYY)	C	0 of 1
28R ✓	GLS-R Rwy 28R (EDDYY)		
28R	GLS-R Rwy 28R (ARCHI)	D	0 of 2
28L ✓	GLS-A Rwy 28L (EDDYY)		
28L	GLS-A Rwy 28L (FAITH)		
28L	GLS-A Rwy 28L (ARCHI)		
28R ✓	GLS-A Rwy 28R (EDDYY)		
28R	GLS-A Rwy 28R (FAITH)	E	0 of 2
10L ✗	GLS-A Rwy 10L (STINS)		
10R	GLS-A Rwy 10R (STINS)		

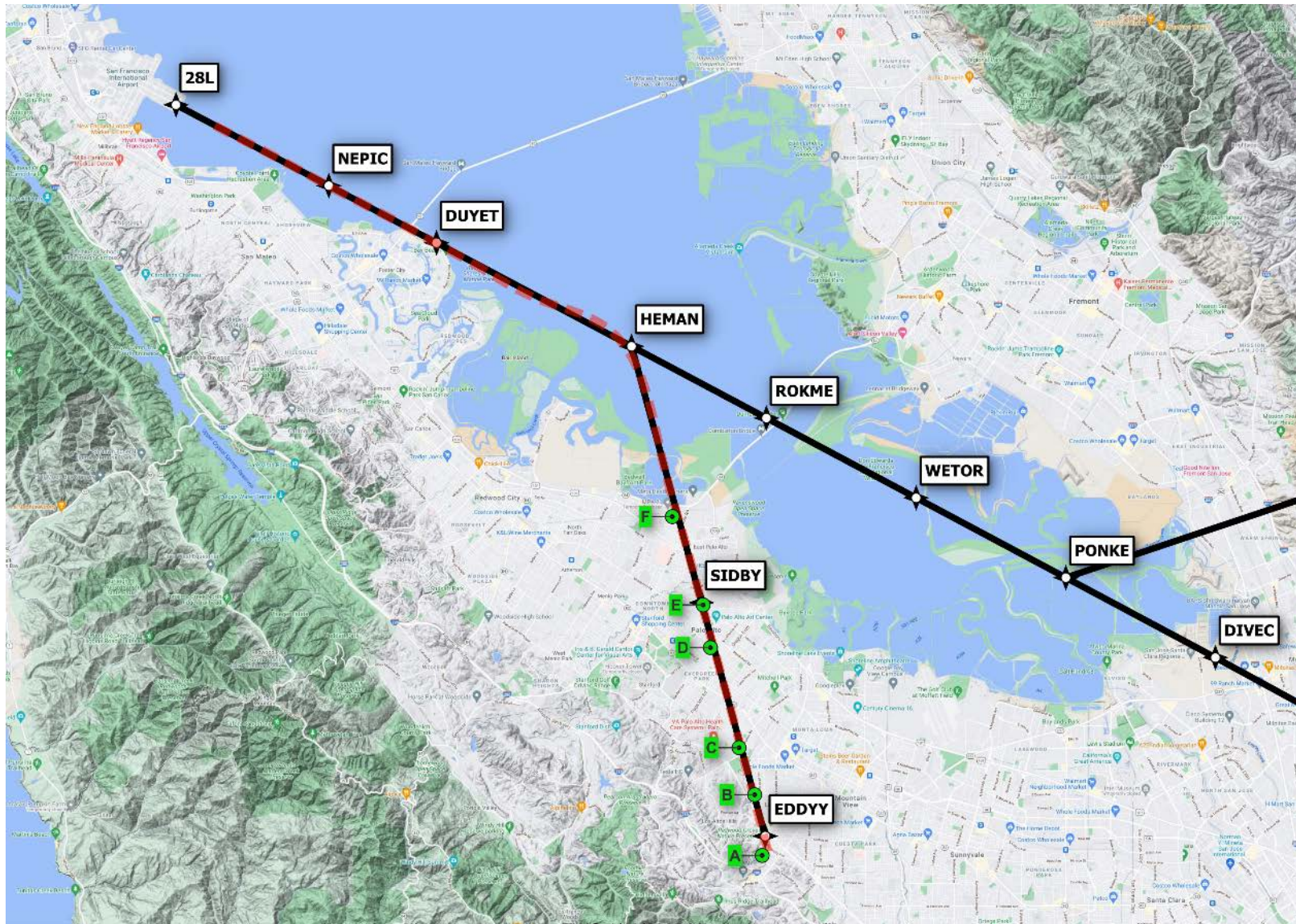
UAL Eval Flight: Existing RNAV (GPS) Rwy 28L



UAL Eval Flight: Existing RNAV (GPS) Rwy 28L



UAL Eval Flight: GLS-A Rwy 28L



UAL Eval Flight: GLS-A Rwy 28L

SAN FRANCISCO, CALIFORNIA AL-375 (FAA) 20310

WAAS CH 53415 W28B	APP CRS 284°	Rwy Idg 10275 TDZE 13 Apt Elev 13
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RNAV (GPS) RWY 28L

SAN FRANCISCO INTL (SFO)

RNP APCH.
 ⚠ For uncompensated Baro-VNAV systems, LNAV/VNAV NA below 3°C or above 54°C. For I-prop ALS, increase LPV† all Cnts visibility to 2½ SM, increase LNAV/VNAV all Cnts visibility to 2 SM. Circling NA to Rwy 10L, 10R, 19L and 19R. Circling Rwy 1L, 1R NA at night.
 #RVR 1800 authorized with use of FD or AP or HUD to DA.

MALS MISSED APPROACH: Climb to 1020 then climbing left turn to 4000 direct OLYMM and hold, continue climb-in-hold to 4000. #Missed approach requires minimum climb of 330 feet per NM to 1600.

D-ATIS 113.7 115.8 118.85	NORCAL APP CON 134.5 338.2	SAN FRANCISCO TOWER 120.5 269.1	GND CON 121.8	CLNC DEL 118.2	CPDLC
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MISSED APCH FIX
 OLYMM 278° 098° 4 NM

ELEV 13	TDZE 13
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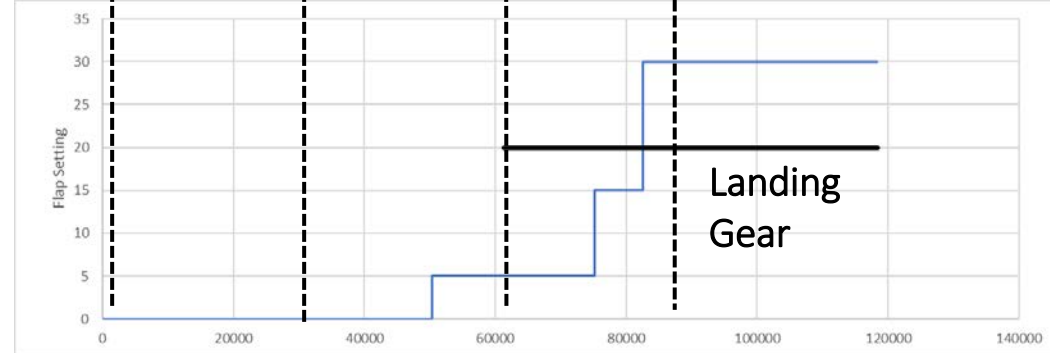
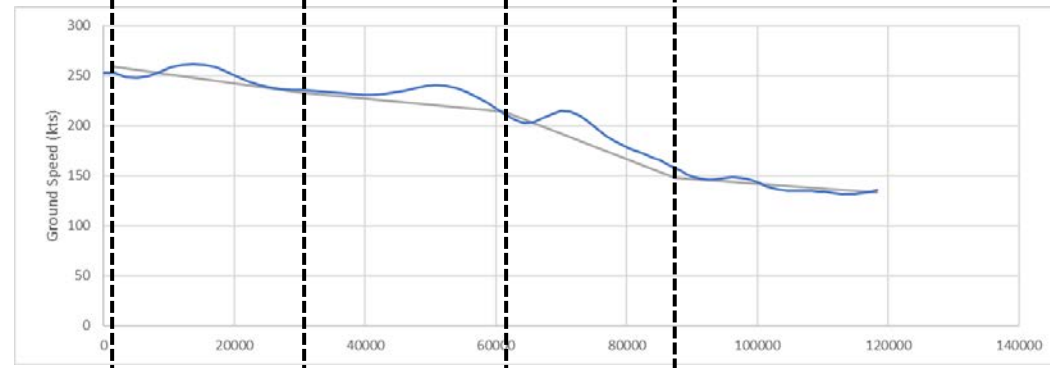
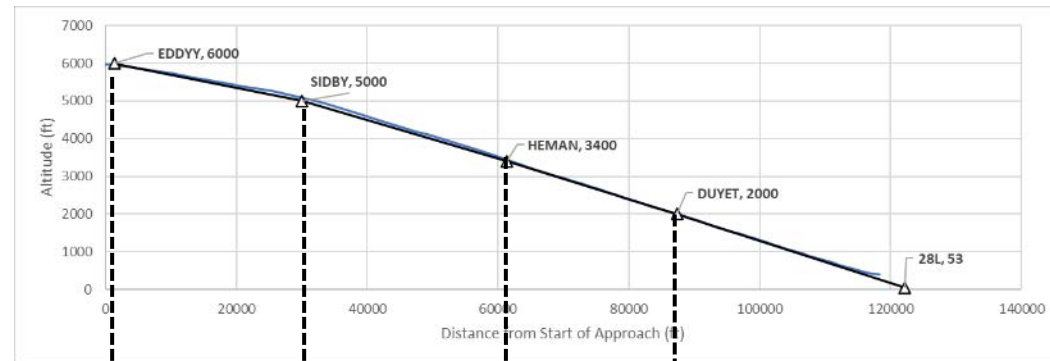
1020	4000	OLYMM	VGSI and RNAV glidepath not coincident (VGSI Angle 2.85/TCH 67). HEMAN
			NEPIC 3.4 NM to RWY28L
			*LNAV only

CATEGORY	A	B	C	D
LPV DA#	213/24	200 (200-½)		
LPV DA†	798-1¾	785 (800-1¾)		
LNAV/VNAV DA	770-1¾	757 (800-1¾)		
LNAV MDA	1020/40 1007 (1100-¾)	1020/55 1007 (1100-1)	1020-2½ 1007 (1100-2½)	
CIRCLING	1020-1¼ 1007 (1100-¼)	1020-1½ 1007 (1100-1½)	1560-3 1547 (1600-3)	NA

HIRL all Rwys
 TDZ/CL Rwys 19L and 28R
 REIL Rwys 1L, 1R and 10L

SAN FRANCISCO, CALIFORNIA Amdt 7 13SEP18 37°37'N-122°23'W SAN FRANCISCO INTL (SFO)

RNAV (GPS) RWY 28L

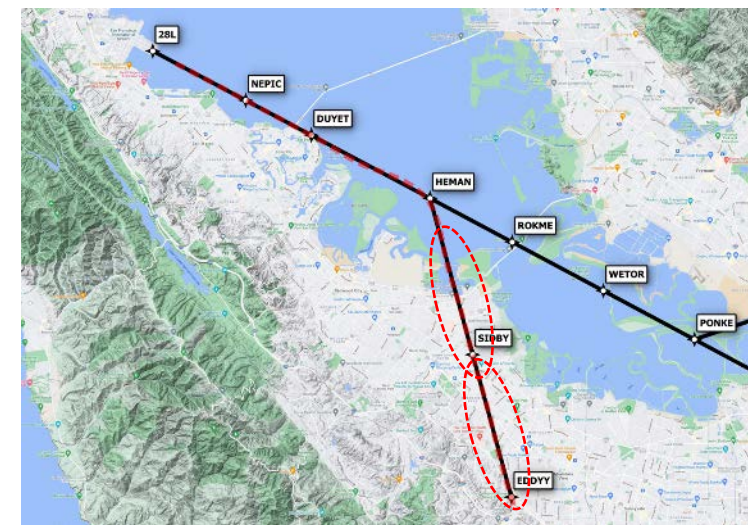


SW-2, 25 MAR 2021 to 22 APR 2021

SW-2, 25 MAR 2021 to 22 APR 2021

Summary of UAL Evaluation Flight Results






1. All approaches, both existing and innovative, used flight idle thrust
2. Existing RNAV (GPS) approaches required significant energy reduction techniques
 - Speed brake deployment either between EDDYY and SIDBY or SIDBY and CEPIN/HEMAN
 - Higher flap settings, earlier in the approach
 - Early gear deployment
3. Innovative GLS approaches (GLS-DB, GLS-A, GLS-R) required less energy reduction techniques
 - ✓ No speed brake deployment
 - ✓ Lower flap settings until closer to the final approach
 - ✓ Delayed gear deployment (over water)



Areas of speed brake and early flap deployment on existing approaches

Innovative GLS approaches appear to have the intended aerodynamic effect of keeping the aircraft clean

Group 1 Innovative GLS Approaches

Runway	Community Package	Description	Project Goals	Approval Group	Submitted to IFP Gateway
28R	GLS-DB Rwy 28R (DBAYY)	Overwater/Dispersion Opportunity		A	0 of 1
28R	*GLS-BVE Rwy 28R (EDDYY)	Visual approaches that currently provide noise benefits converted to GLS		B	0 of 3
28R	*GLS-BV Rwy 28R (ARCHI)				
28L	*GLS-TT Rwy 28L (EDDYY)				
28R	*GLS-TT Rwy 28R (EDDYY)				
28R	**GLS-R Rwy 28R (EDDYY)	Highest possible altitudes over South Bay Cities		C	0 of 1
28R	**GLS-R Rwy 28R (ARCHI)				
28L	GLS-A Rwy 28L (EDDYY)	Higher altitude versions of existing RNAV approaches		D	0 of 2
28L	GLS-A Rwy 28L (FAITH)				
28L	GLS-A Rwy 28L (ARCHI)				
28R	GLS-A Rwy 28R (EDDYY)				
28R	GLS-A Rwy 28R (ARCHI)				
10L	***GLS-A Rwy 10L (STINS)	Introduces first precision approach to runway 10L/R		E	0 of 2
10R	***GLS-A Rwy 10R (STINS)				

CFPP Modeled Noise Reduction

CFPP Modeled Noise Neutral

CFPP Modeled Noise Reduction with small Noise Increases

*Enabling existing noise reduction procedure to be more frequently used by aircrafts
 **CFPP model being updated
 ***Extremely infrequently used procedure

SFO GBAS Project Team is Working On

- Publish the GBAS Noise Measurement Report on <https://noise.flysfo.com>
- Commissioning and Operation of GBAS
- Awaiting confirmation to submit Group 1 procedures into the IFP Gateway
- Group 2A noise evaluation

SFO GBAS Project Team is Seeking

- Roundtable confirmation to move one or more Group 1 Community Flight Procedure Packages (CFPP) to the IFP Gateway
- Review GBAS Noise Measurement Report

Questions

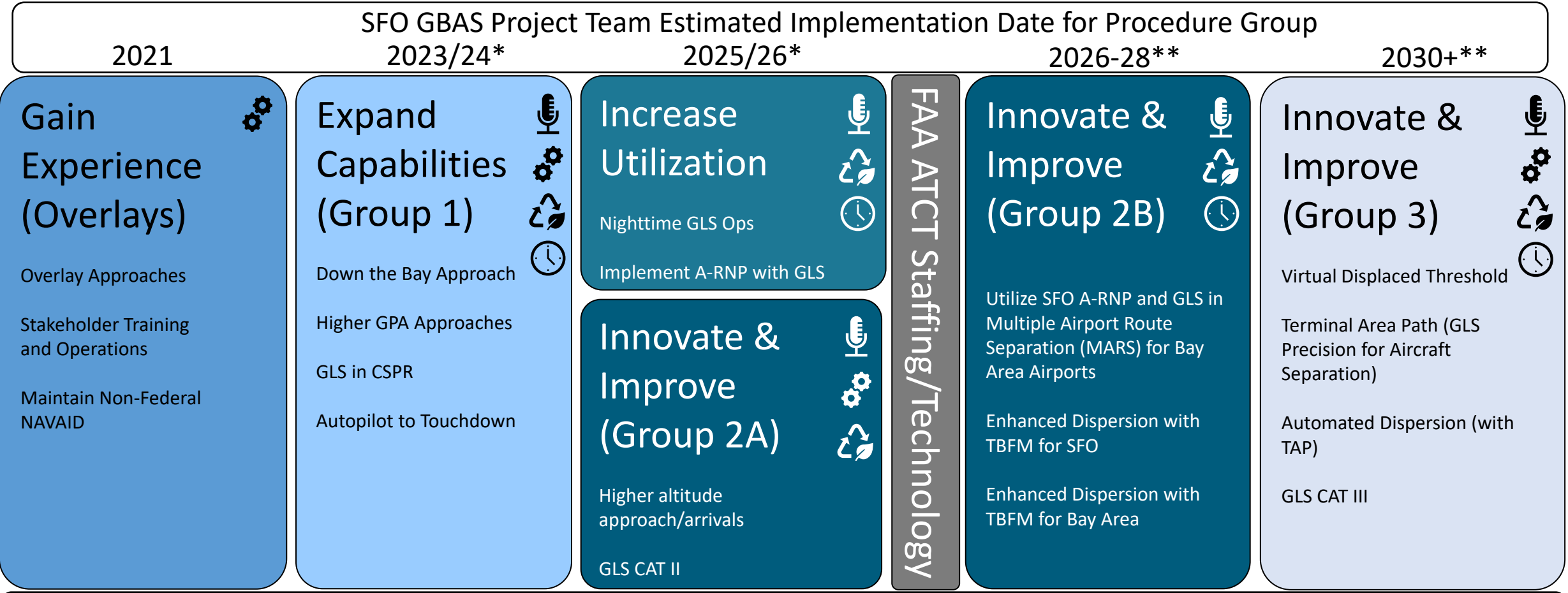


<https://noise.flysfo.com>

Backup Material



SFO GBAS Project Team Estimated Implementation Date for Procedure Group



Measure Utilization, System Availability, Noise, ATCT Feedback and Pilot Feedback

Collaborate Research, Technology, Criteria, Infrastructure and Experience through interactions with FAA, Global Aviation Community, Academia and Residents of the Bay Area

*Timeline estimates are based on FAA Production Capabilities and Feedback From Communities
 **Timeline estimates are based on generalized feedback from Flight Procedures Subcommittee Participants and may increase or decrease depending on factors beyond the GBAS project

Group 1 Innovative Approach Completed and Planning for Group 2A

SFO GBAS Project Team has uploaded new CFPPs for Innovative GLS Procedure Concepts

- The SFO GBAS Project team is uploading Community Flight Procedure Packages (CFPPs) to evaluate the difference between Innovative GLS Approach concepts and the nearest existing approaches
 - 14 CFPPs (1 for each Innovative GLS Approach and Starting Point)
 - Includes 2 New CFPPs for Tipp Toe
 - 4 Aircraft Types
- The CFPPs will continue to be updated based on flight evaluation results, potential changes to the procedures or additional supporting information
 - GLS-R Rwy 28R is being updated to match recommendations by residents and TWG participants to eliminate possible noise increases near Foster City

SFO GBAS Project Team is beginning evaluation of Group 2A Procedures

For Community Evaluation Only - Not Intended for Navigation

GLS-TT RWY 28L (EDDYY)	Revision 1
	Changes: New

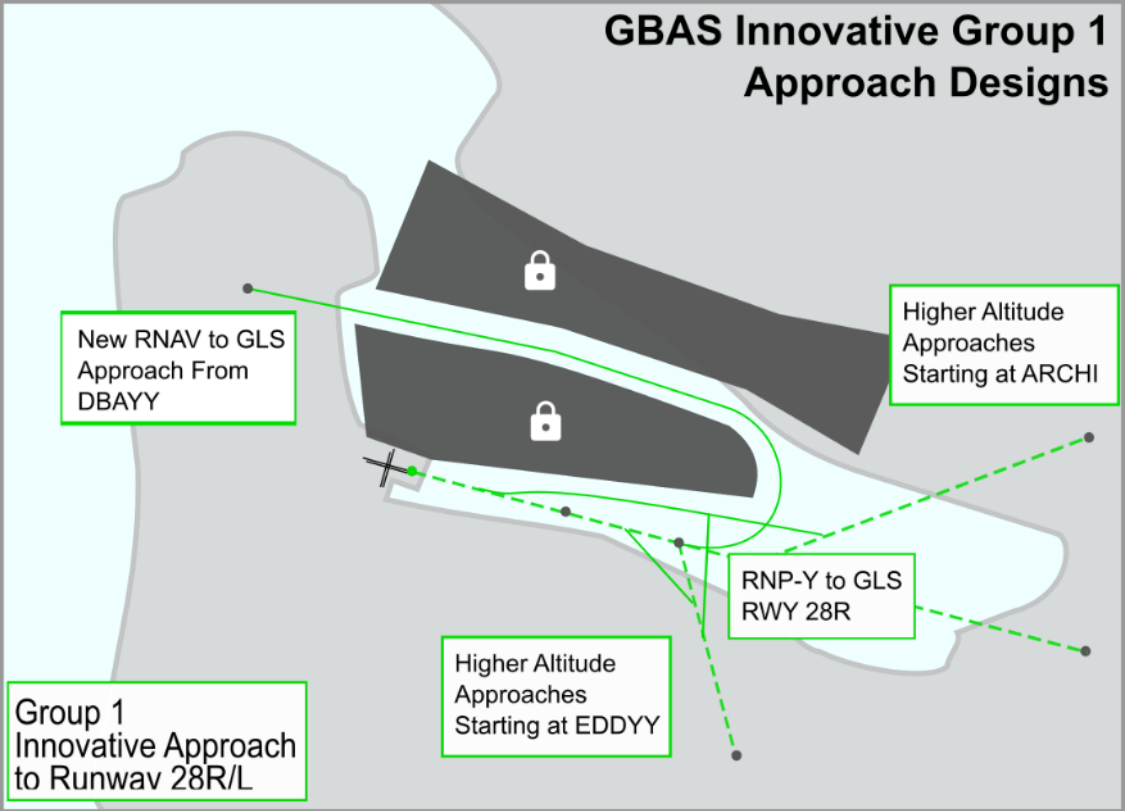
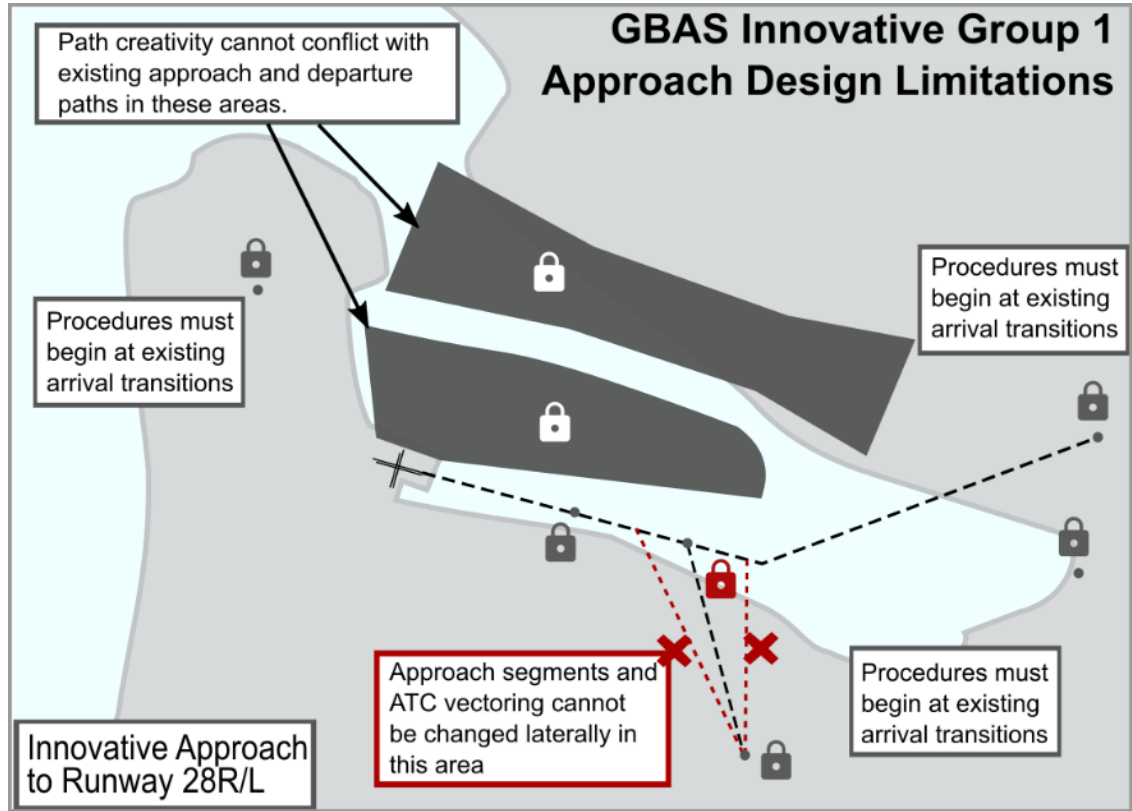
Google Earth

<p>GLS Instrument approach to runway 28L originating southeast of the airport, starting at EDDYY.</p> <p>This approach is an identical overlay of the existing Tipp Toe Charted Visual Flight Procedure (CVFP) approach, in use today, under VFR conditions. The GLS version of the approach converts optional CVFP published altitudes into required minimum IFR altitudes.</p>	<p>Project Goals</p> <ul style="list-style-type: none"> ✓ Noise reduction ✓ ILS Redundancy ✓ Efficiency ✓ Reduce Delays
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<https://noise.flysfo.com/>

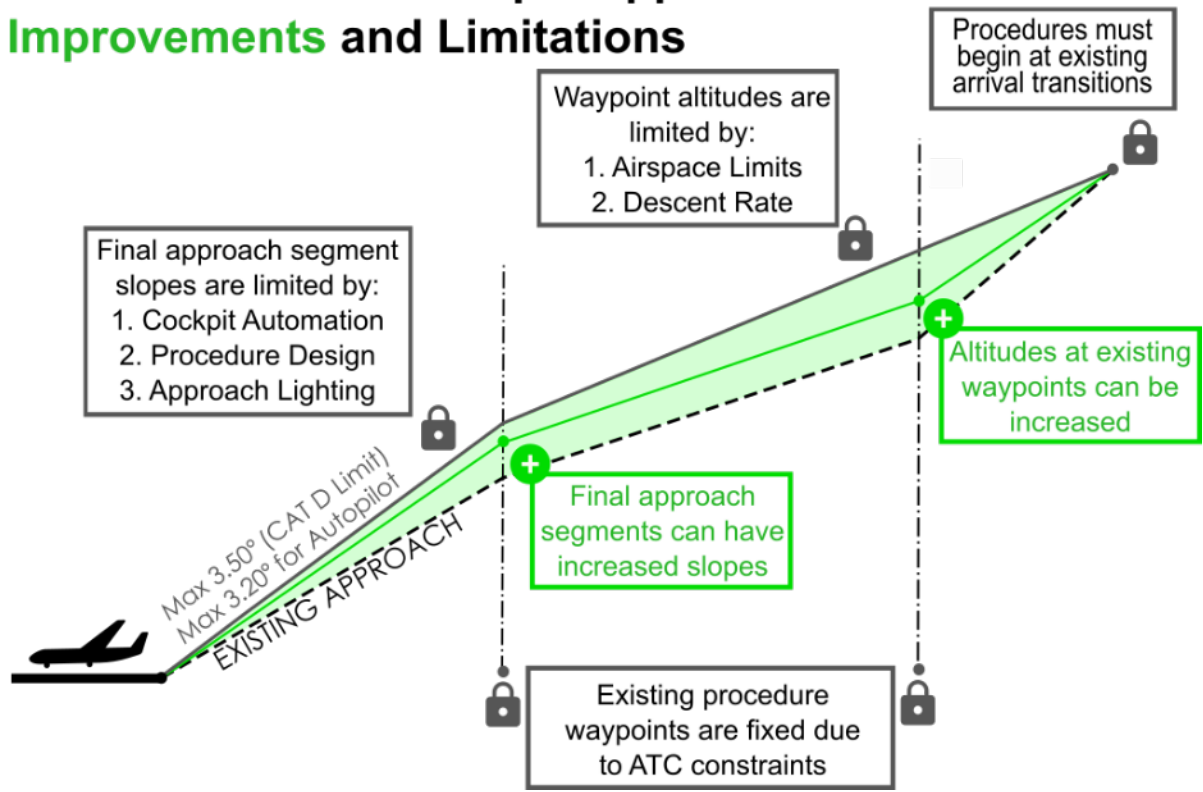
<https://noise.flysfo.com/2021/05/14/gbas-innovative-approach-procedures/>

Group 1 Innovative Approaches

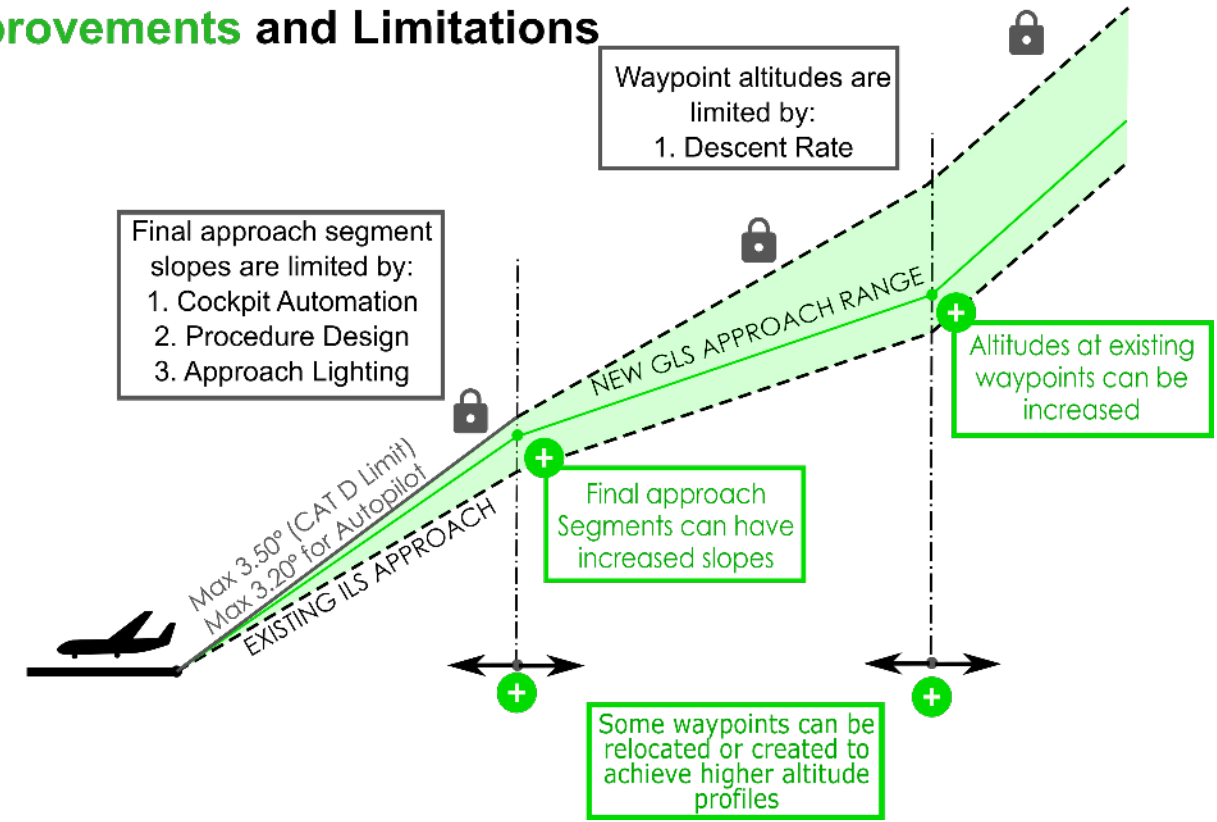


Comparison of Group 1 Innovative Approaches to Group 2A

GBAS Innovative Group 1 Approach Improvements and Limitations



GBAS Innovative Group 2A Approach Improvements and Limitations



Preliminary Group 2A Concepts

Altitudes at EDDYY between 6700ft and 7300ft

Higher altitudes require

Would require changes to SERFR (Either higher altitude at EDDYY or new parallel offset to FOLET-EDDYY terminating at a new waypoint)

Higher altitudes over residential areas are achieved by aircraft initially descending along RNP-Y path over the Bay

