

Ad Hoc Cmte - Mitigation List

Suggestion	Category of Proposed Change	High Level Description	Details	Notes & Questions	FAA or SJC Response	Potential ++ Pros / -- Cons
A	Modify the way planes fly	Limit speed to slowest & safest possible	Limit speed to a minimum necessary for safety on approach.  At 220kts, Airframe noise = Engine noise for departures. Since engine noise on arrivals is almost certainly lower than on departures for any given speed, the guidance would be to reduce the airframe noise as much as possible (until it reaches the engine noise): to do this, fly slower and cleaner.	Minimum safe speed varies by airplane. It is the minimum above the stall speed. Within reason, favor lower peak noise levels over shorter noise duration. During south flow, people can be indoors with windows closed. Minimizing peak noise levels will reduce the number of noticeable events indoors.		
B	Modify the way planes fly	Limit speed to lowest possible when under 4000'	Limit speed to a maximum necessary for safety on approach when airplanes are 4000' or lower.	Minimum safe speed varies by airplane. It is the minimum above the stall speed.		
C	Modify the way planes fly	Glide (OPD?)	Have planes glide to landing to eliminate noise from engines and minimize use of lift devices (flaps, slats) and braking devices.	Is FMS or pilot in control?		
D	Modify the way planes fly	Raise altitude	Raise altitude along the approach, provided airplanes do not have to fly dirtier or use jet thrust.			
E	Modify the way planes fly	Raise altitude at ZORSA	Return ZORSA to 3,200' and make it a minimum altitude, provided airplanes do not have to fly dirtier or use jet thrust.	Why not? - FAA safety standards? Is the altitude at ZORSA a Minimum En Route Altitude (MEA instead of a crossing altitude)? A commercial pilot reviewing the RNP AR Z approach said that he wouldn't be surprised if the 3000' altitude was programmed into the FMS. We should be able to determine this. The FAA Design Guide for OPD procedures advocates 'path flexibility' as a means to enable airplanes to descend efficiently and at a quiet idle. The fewer constraints in OPD paths and arrival procedures, the more freedom planes will have to descend efficiently and quietly.		
F	Modify the way planes fly	Relax altitude at HITIR	Relax the altitude requirements at HITIR from exactly 4000' to at or above 4000'.	Use the additional altitude to reduce the need for lift devices and thrust during the remainder of the approach over residential areas. The FAA Design Guide for OPD procedures advocates 'path flexibility' as a means to enable airplanes to descend efficiently and at a quiet idle. The fewer constraints in OPD paths and arrival procedures, the more freedom planes will have to descend efficiently and quietly.		
G	Modify the way planes fly	Relax altitude and speed at HITIR	Allow planes to arrive at HITIR at altitudes and speeds that allow them to reach the Bay without flying dirty or using thrust.	The FAA Design Guide for OPD procedures advocates 'path flexibility' as a means to enable airplanes to descend efficiently and at a quiet idle. The fewer constraints in OPD paths and arrival procedures, the more freedom planes will have to descend efficiently and quietly.		
H	Modify the way planes fly	Optimize descent profile to HITIR (OPD?)	The FAA should initiate R&D to enable ATC procedures that would encourage vectored airplanes to descend at a glide.			
I	Modify the way planes fly	Use gradual, smooth descent (OPD)	Have planes gradually descend along a smooth descent flight pattern to limit stepping and the need for engine changes to maintain altitude.	Need to determine the amount of stepping that is currently occurring and where it is occurring. Need to understand how low a plane should go over which areas even with no steps.		

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J	Modify the way planes fly	Limit or defer flight procedures that are noisy	Design arrival and departure procedures to minimize noise. Establish noise monitors in entire low altitude areas around airport. Compare noise as measured on the ground under varying weather conditions for procedures when 1) flown by pilots and 2) flown by flight management systems. Report results, along with 3) the modeled noise prediction(s).	Are we measuring when FMS or pilot controls? What design data is available to route designers? Which flights are noisier? Why? The definition of a noisy procedure needs to be clarified - start with use of lift devices, braking devices and jet thrust. How will we measure this? We need to get long-term, reliable and government acknowledged noise monitoring. Per the FAA, the FAA's noise modeling tool, AEDT version 2d, is being improved. Later this year, AEDT version 3a is "Seeking to improve abilities at lower DNL. Improving takeoff weight and thrust modeling; Improving aircraft performance module". AEDT4 will "incorporate airframe noise more explicitly" in a post 2020 release. Source: Dr. James Hileman presentation, 2/27/18.		
K	Modify the way planes fly	Optimize procedures for noise	Optimize all arrival and approach procedures for noise assuming the weather expected when the procedures are to be deployed. Bring focus to the 75% of flights that do not fly the RNP approach.	How? One idea: Allow aircraft to arrive at different altitudes at HITIR. Use the additional altitude to reduce the need for lift devices and thrust during the remainder of the approach over residential areas. Especially appropriate for vectored flights. When optimizing for noise, procedure designers should factor in weather expectations, and should assume the wind direction, wind speed and temperature that are most common when the procedures are to be deployed. South flow is used in the cooler winter months and is only triggered when a tailwind of 5 knots or more is expected.		
L	Modify flight paths	Change RNP path	Move RNP path North (over Bay not over other cities) to reduce noise. Also disperse flights along rails (Western rail and turning rail.) Better yet, eliminate the RNP path which would eliminate the rail.	Preliminary DB meter noise readings are indicating that the RNP path is louder than the planes flyint the ILS path. The tight turning radius seems to create more noise for many of these planes. If no mitigation is accomplished for the RNP, then more and more planes will be shifted to this very loud flight path. This flight path has been built on efficiency only, and disregards the excessive noise created for residents under this tight turning loop.		
M	Modify flight paths	Move turn over Bay	Move flights from the SW in their Northern turn over the Bay. Current, published flight path exists, but is no longer frequently used.	MV/LA consultant is working on a potential path. Expanding the Northern loop only helps if it also means altitude is raised over the cities.		-- Potential of moving noise over another city or different group of residents.
N	Modify flight paths	New path from East	Create a new path that approaches airport from the East.	An East approach leads to significantly less residential noise compared to South flow flights approaching from the West - flights approaching from the West fly over at minimum 15 miles of dense residential areas. Eastern approaches would be approx 1 mile of residential with the remainder generally industrial. In 2015, an analysis of FAA FOIA data shows that 32% of the South flow flights approached SJC from an easterly direction. This percentatge is decreasing with time, and these planes are being "rolled" into the rail. These Eastern approaches need to be preseved, and not reduced. Examination of an East approach into SJC was recommended as a possible noise mitigation by the FAA The East route would shorten the path and increase flight efficiency for planes originating from the East side of the United States Planes already fly these East routes.		++ Moves South flow traffic from SJ, Cup, SV & MV to over the Bay.
P	Modify flight paths	Community defined flight paths	Where does the community want the planes to fly?	The community is united in asking for flights to be dispersed as they were prior to 2012.		

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Q	Disperse flights	Revert to pre-2012 paths and dispersion	Manually disperse flights paths to pre-2012 levels, or create and publish multiple flight paths that will accomplish similar dispersion such as reverting the waypoints back to pre-2012 waypoints/flight paths.	The FAA stated that safety will always be better with an RNAV approach than with vectoring. Is there a study that proves this claim? Also, health needs to be considered along with safety. The health effects of fine particulate matter from airplanes being concentrated on a narrow band of residents are being studied and those findings should be factored in. The prior dispersed flight paths were safe and successful for decades. The current flight mix and volumen at SJC is similar to the mix and volume that existe during the dot com boom so dispersion should be achievable again.		
R	Disperse flights	New parallel flight paths to West	Create additional flight paths to the West of current paths by vectoring planes toward different locations along the Bay.	The objective is to reduce the number of flights flying the rail that takes planes from JESEN to ZORSA and beyond along the same heading into Palo Alto. Planes would be vectored off this rail at different locations and with different headings, resulting in their crossing Hwy 101 at locations along its length.		-- Flights over the Santa Cruz mountains are more turbulent.
S	Disperse flights	New parallel flight paths to East (fan out flight paths)	On the STAR Arrival procedures, recast ZORSA and HITIR as fly-by waypoints. Relocate HITIR to be as close to JESEN as possible or perhaps eliminate it. If design criteria prohibit this, terminate the STAR procedures at JESEN.	A fly-over waypoint concentrates flights. Today ZORSA is located to accommodate the turning radius of the largest planes. As a fly-by waypoint, smaller planes could turn sooner, dispersing the flights. By moving or eliminating HITIR maximum dispersion would be possible after JESEN. Recasting ZORSA and HITIR as fly-by waypoints on the RAZRR and SILCN STAR procedures would permit airplanes to begin their turns to the Bay as soon as possible after JESEN, based on the turning radiuses of those airplanes and the programming of their FMS'es. This would reintroduce some dispersion as planes 'peel off the rail' early and at different places.		
T	Disperse flights	Automate dispersion	Modify the NextGen system to automatically disperse flights. Automated dispersion addresses safety, efficiency, and noise.	Automated dispersion addresses safety, efficiency, and noise. It will create safe dispersion. If flight dispersion is required, then technology to automate that dispersion will be developed. For effective noise mitigation, flight paths miles wide are needed (because of the way airplane noise travels). Dispersion will stop the rail from disproportionately impacting residents under the narrow flight paths. When residents purchased their homes, they made decisions based on historical flight paths, now those flight paths have been shifted into narrow rails over residents who previously had very few or no planes flying over thier homes. The rails need to be broken.		++ Addresses safety, efficiency, and noise.
U	Disperse flights	Use multiple flight paths	Define multiple flight paths across the historic corridor and rotate planes between them.	ATC would use each flight path in rotation so as not to burden any one neighborhood with all the flights. The period of rotation would be hours or maybe a day.		-- Too many routes to design.
V	Disperse flights	Charted visual flight procedures	Create a charted visual flight procedure with the turn over the Bay.	FAA suggestion. Also an MV/LA consultant suggestion. Pilots have more discretion when flying a visual approach than when flying RNAV approaches. Issue: Many airlines issue instructions that the pilots must use the regular instrument approaches, however some airlines prefer a charted approach to pilots flying with no defined approach over an area (as is the case today for MV and Palo Alto for planes not flying the RNAV RNP approach).		++ Provides pilots with another flight path. ++ More likely to be endorsed by airlines and used by pilots. ++ Might align better with historical flight corridor because an RNAV visual approach permits a sharper turn than RNP does. -- Can only be used when visual approach can be used which may be limited when South flow is used and weather causes low visibility.

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W	Disperse flights	Revert final waypoint to PUCKK	Revert the final waypoint on the STAR procedure to PUCKK. (On JAWWS TWO) This was the final waypoint for SJC south flow in 2012.	Historically, planes missed the PUCKK waypoint far more than they hit it. The expectation is that, going forward, almost all planes would peel off the procedure before reaching PUCKK, recreating the earlier dispersion. Since JESEN was not a waypoint when PUCKK was in use, flights were centered on a point ~0.25nm east of JESEN.		
X	Disperse flights	Revert final waypoint to JESEN	Revert the final waypoint on the STAR procedure to JESEN (on JAWWS THREE). Remove HITIR, ZORSA and flight headings after JESEN from airplanes' Flight Management Systems databases. Encourage ATC to disperse flights.	Airplanes change heading after JESEN. The idea is to allow airplanes to turn at very slightly different times and possibly slightly different headings after JESEN to break up the rail.		
Y	Disperse flights	Relax waypoints	Give planes more flexibility around hitting the waypoints.	The FAA Design Guide for OPD procedures advocates 'path flexibility' as a means to enable airplanes to descend efficiently and at a quiet idle. The fewer constraints in OPD paths and arrival procedures, the more freedom planes will have to descend efficiently and quietly.		
Z	Disperse flights	Move, eliminate waypoints	Move or eliminate waypoints.	The FAA Design Guide for OPD procedures advocates 'path flexibility' as a means to enable airplanes to descend efficiently and at a quiet idle. The fewer constraints in OPD paths and arrival procedures, the more freedom planes will have to descend efficiently and quietly.		
AA	Disperse flights	Approach tailored to plane size	Define different approach paths for large and medium-to-small planes. An approach path could be created after JESEN suitable for medium-to-small planes. ZORSA could be used by large planes.	Large planes need a wider turning radius than small planes. Multiple flight paths based on size would introduce some dispersion.		-- Return to historic corridor over Sunnyvale. -- Too many routes to design.
BB	Disperse flights	Efficiency or not procedures	Define two sets of procedures – one for when efficiency is demanded (which is more noisy), one for when efficiency is not required (which is less noisy).	During non-peak hours, noise-optimized procedures would be used.		
CC	Disperse flights	Discourage concentration	Discourage narrow, concentrated (single line) flight paths. Stop eliminating discretionary paths.	Can ATC (Flight Controllers) do this? How?		
DD	Penalize noise	Expand noise curfew hours	Change curfew hours to 10:00 pm - 6:30 am (from 11:30 pm - 6:30 am) perhaps just when using South flow is being used.	Curfew hours only prohibit noisy flights from using the airport during those hours. Quiet flight can still use the airport during curfew hours. Exceptions exist for weather, mechanical, etc. issues. SJC is grandfathered into having a curfew. No new curfews can be established. Grandfathered curfews are not likely to be allowed to change. Which entity controls the curfew at the airport - SJC. What would be done with the money collected - SJC collects. How would changing the curfew impact the overall schedule for SJC - Very little.	Airport: Not directly related to south flow arrivals. The Federal Aircraft Noise Capacity Act (ANCA) of 1990 controls Noise Ordinances. This act does not permit the enactment of increased restriction to airport flight/noise restrictions without federal approval, which has been withheld in all cases to-date. Given this, the Airport does not have the authority to make the curfew more restrictive.	
EE	Penalize noise	Increase noise curfew violation fines		SJC defines the fines and fines exist. \$2,500 per occurrence, with many exceptions granted. Very few aircraft are not allowed to fly at night.	Airport: See answer to DD	
FF	Penalize noise	Base landing fees on noise generated during arrival		What would be done with the money collected? How do we determine the definition of noise that should be charged a fee? How can this be measured? Airport authority controls the landing fees at SJC.	Airport: See answer to DD	

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GG	Penalize noise	Require Airbus 320 air deflectors	Require Airbus 320 family to install "wake vortex generators"	Other cities have done this. Who controls the authority to require this? UA started their retrofit in Nov 2017. SJC can impose limits of use & fines. At a recent SFO Roundtable, SFO staff suggested they had some ideas for how to encourage airlines to install vortex generators if they were initially reluctant. Discuss with them.	Airport: The SFO Select Committee made a recommendation that the FAA require operators of the A320 family to install "wake vortex generators", however the FAA response was that this was outside their area of authority. SJC estimates that roughly 6.7% of south flow flights are from this family of aircraft.	-- A given airline would have to do this to their entire fleet of the aircraft type as they don't know which aircraft will end up on a specific flight.
HH	Penalize noise	Require curfew violation reporting	Require flights landing during the noise curfew to report online what is causing them to violate the noise curfew in advance of their landing.	How will they know that a problem exists? What is a quiet vs. a noisy procedure? What is definition to use? What would they do if it did? Need to model noise and use model to decide if exceeded. Easy to say that a 'safety' issue caused it. At the Airplane Noise Symposium in Long Beach in late February, it was reported that one airport had success with this approach.	Airport: Noise curfew violations are posted online. <a href="https://www.flysanjose.com/noise-reports">https://www.flysanjose.com/noise-reports</a>	
II	Reward quiet	Incentives	Provide incentives to airlines to fly quieter.	Need to define definition of quieter. What incentives and how are they funded? dBA is the accepted unit of measurement. Individual cities have their own limits FAA has limits too, but allows "emergency procedures".	Airport: See answer to DD	
JJ	Change SJC operations to reduce noise	Remove displaced runway designation	Remove the displaced runway designation at SJC in order to make use of full runway so that reverse flow might not need to be used so often.	This may not be achievable because of the height of buildings in downtown SJ. And, the community does not want a longer runway to lead to bigger airplanes.		-- Very expensive
KK1	Change SJC operations to reduce noise	Use GBAS	GBAS (Ground-Based Augmentation System) is a system that augments the primary airport systems and provides enhanced management of all phases of approach, landing, departure and surface operations. It can result in differentiated landing positions on a runway.	Is this still at the beginning (experimental) phase? How long until this is ready for full use?	Airport: According to an FAA report dated September 2017 Honeywell has an operational CAT I GBAS system available at Newark and Houston as Non-Federal systems (airport sponsored). Current airlines utilizing this system at these two airports which also operate at SJC are United, Delta, Lufthansa and British Airways. However, only select planes have the necessary equipment to utilize the system and runway length matters. It's still very much in development and testing. CAT II/III systems are not yet operational. Boeing is also testing a GBAS system. Airport: Initial reports are that if a runway is long enough, it may lower overall noise impacts in some communities due to the shifting of the approach path. It's probably important to understand that the installations currently using GBAS or piloting GBAS are all large hub airports, which serve as a hub for a commercial airlines or are participating as part of R&D. As an example EWR and IAH are both hubs for United Airlines, as is SFO, which is currently conducting a pilot program. Since this is a non-federal program the airlines and airports are paying not only for the installation but also the maintenance of GBAS. These costs may be prohibitive for a medium hub airport, especially one without an airline hub.	== SJC - While GBAS may potentially lower noise around some airports, given the flight path and runway length, it is questionable if GBAS is feasible for SJC.
KK2	Change SJC operations to reduce noise	Trigger when greater than 5 knots	Trigger South flow operations when wind is at 6 knots, or 7 knots, or 8 knots, or 9 knots, or 10 knots. (Use highest safe value)	MV/LA consultant has indicated that the FAA is looking at increasing the trigger to 10 knots at all airports. There should be a special study commissioned by the FAA for SJC to determine whether a limit of 6, 7 or more knots could be feasible given SJC's specific runway length and other constraints.	FAA: The wind and FAA Order 7110.65 determine the active runway at SJC. In accordance with paragraph 3-5-1 of FAA Order 7110.65, when there is a tailwind of 5 knots or more, SJC Tower must utilize RWY 12. This is the least favorable configuration for both the Tower and TRACON and it is not utilized more than is necessary.	
LL	Change SJC operations to reduce noise	Monitor noise	Monitor noise North, East and West of the airport at various distances from the airport on an ongoing basis.	It is essential to understand noise (from monitors)		

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MM	Change FAA operations to reduce noise	Stricter rules for ground noise	FAA to change its procedure development process to introduce optimization of proposed flight plates for noise, even for changes that are not judged to be 'significant'.	This might be a methodology change within the FAA process for review of procedure changes. Draft flight plates should be reviewed by a team of noise specialists to see if their proposals can be further optimized for noise before publishing them for review. The Committee heard from an FAA procedure designer that if a procedure is not at risk of violating FAA noise thresholds, the designers need not optimize for noise.		
NN	Change FAA operations to reduce noise	Change when information is provided to pilot	ATC must provide information to pilot sooner.	What Information? How will this impact noise to our residents? Is a safety consideration - need to keep pilot load light as possible on approach and landing.		
OO	Change FAA operations to reduce noise	Model changes for noise	Model all changes prior to implementation in order to minimize noise impact on residents. Assume varying weather conditions. Ground noise monitors should be used to validate the models.	Use theoretical models and compare computer predicted flight maneuvers with actual flight simulators to align with what pilots are really doing. Ground monitors should be used to validate the simulation predictions. To understand the real-world noise impact, varying weather conditions must be assumed, particularly given the tight constraints imposed by Precision Based Navigation (PBN).		
PP	Provide SJC with more airspace	Reduce SFO BDEGA West arrivals into SFO	Route more SFO arrivals through the BDEGA East over the Bay so that there are fewer BDEGA West arrivals from the North.	Balanced Runway usage is the goal. But the reality is that if a quieter runway is free, they should use it.		
QQ	Provide SJC with more airspace	Route SFO SERFR South arrivals over South East corner of Bay	Have SERFR South arrivals join DYAMD or fly a similar route parallel to and/or above DYAMD.	Could also address the noise problem of SJC BR1XX arrivals since BR1XX altitude could be increased because SERFR would no longer be a constraint. BR1XX is a SJC arrival route that flies under SERFR.		
RR	Provide SJC with more airspace	Route SFO West oceanic arrivals to BDEGA over ocean and change vectors of BDEGA West arrivals	Have SFO oceanic arrivals from the West join BDEGA over the ocean West of the Golden Gate Bridge rather than use MENLO. SJC South Flow would then only compete with BDEGA West arrivals. Vector BDEGA West arrivals to maximize vertical and lateral separations for aircraft flying in opposite directions (BDEGA flights going North and SJC flights going South).	This is the Golden Gate 7 approach Must be done with adequate time to reprogram FMS.		++ Cost, if done soon after takeoff, would be almost non-existent. -- Last minute changes can impose errors.
SS	Provide SJC with more airspace	SJC use SFO space when SFO changes pattern	Allow SJC to use some SFO airspace when SFO changes their landing pattern, since SFO flights are at high altitudes when they are close to SJC.	Needs to be coordinated with Nor Cal TRACON. Need to carefully model all possibilities.		-- SFO might ask for more of SJC airspace in return
TT	Other	Create technical working group	Create technical working group to study each of the proposals in conjunction with the FAA. Present findings and recommendations during ad hoc committee meetings for full discussion and final recommendations.	Roundtable at Cities Association which includes Santa Clara and Santa Cruz counties. Should it also include Alameda county so cities in the East Bay that currently have SJC traffic are included?		