

Survey Results for SAN RWSL Tests of Runway Entrance Lights (RELs)

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Survey Results for SAN RWSL Tests of Runway Entrance Lights (RELs)

- Surveys administered for all SAN REL tests, including:
- Shadow Operations of RELs, May 1-27, 2006
 - Surveys completed by 19 SAN TWR Air Traffic Controllers (ATC)
 - Surveys comprised of 10 questions posed with a bipolar response scale
 - Conducted at SAN in operational Tower
- Operational Evaluation of RELs at SAN, December 2006 present (February 2007)
 - Surveys completed by Airline Pilots
 - Conducted at SAN in operational Tower
 - Live traffic and actual operations at SAN on runway 9/27



- Volunteer controllers participated in SAN TWR cab
- Controllers observed:
 - Out-the-window view
 - Light Activation on RWSL laboratory display
- Controllers listened to:
 - VHF comm (Local, Ground)
- Controllers assessed:
 - Light timing (too early, too late, just right)
 - Light on incorrectly
 - **False Activation**
 - Interference
 - Light off incorrectly
 Missed detection



- 1) The timing of the REL activation was consistent with SAN operating practices.
- 2) The timing of the REL deactivation was consistent with SAN operating practices.
- 3) Training for the use of RWSL was adequate for identifying REL anomalies.
- 4) **RELs will help reduce the number of runway incursions.**
- 5) **RELs will increase the safety of ground operations.**
- 6) The use of RWSL will increase ATC/Pilot communications.
- 7) RWSL provides an accurate and timely indication that the runway is occupied or soon to be occupied.
- 8) **RWSL** provides and effective method of confirming real-time status directly to the pilot.
- 9) RWSL will increase my workload.
- 10) RWSL will not distract me from my primary duties.

Note: Response scale was "1. strongly disagree, 2. disagree, 3. neutral, 4. agree, 5. strongly agree"



RWSL SAN REL Shadow Operations Summary Chart of Controllers Survey Results





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RWSL SAN REL Shadow Operations Synopsis of Controllers Survey Results

- All responses above neutral, average was 4.1
- Same modes for both systems, ARCON and MIT Lincoln Lab
- Conclusion from FAA's quicklook report was:
 - The controller questionnaires did not provide general consensus on which system performed better during the shadow operations test. Instead the results of the questionnaires showed that each system is capable of performing its operations satisfactorily.
- Controllers verbal comments have been positive to date and they remain very supportive RWSL.
- Only issue is some pilots confusing the red centerline lights on runway 27 (on from takeoff point to displaced threshold) with red status lights
- Issue to be resolved soon once red runway centerline lights are eliminated
- Controller confidence is high given the lack of any interference from RWSL recorded at SAN to date



MIT/LL Human Factors Liaison with Users Supported Survey Feedback

- Major Carrier at SAN is Southwest Airlines (SWA)
 - Continuing coordination with SWA Chief Pilots office in PHX
 - SWA and APA pilots participated in pre-operational evaluation flight tests at SAN in November, 2006
 - SWA will encourage their pilots to complete the survey once the red lights on RWY 27's centerline have been eliminated
- Airline pilots unions
 - Allied Pilots Association (APA)
 - Airline Pilots Association (ALPA)
- Demonstrations of RWSL Operational Concept and recorded data from SAN Shadow Operations with RELs on screen
 - SAE Behavioral Engineering Committee meeting in San Diego with tour of RWSL laboratory at SAN TWR
- **RWSL articles published**
 - Airline Pilot (ALPA magazine), March 2005, January 2007
- SWA, APA, and ALPA email reminders to pilots
 - Effective at increasing survey response rate



- Survey data being collected from pilots (vehicle operators TBD)
- Verbal testimonials from controllers in SAN tower
- Review of recorded surveillance and audio replays, especially of anomalies
- Research and coordination with SAN Airport Authority on elimination of confusing red lights on runway centerline that are currently operational in an area starting at the takeoff point and ending at the displaced threshold on RWY 27
 - Note: these red lights were not on during pre-operational evaluation flight tests of RELs at SAN in November 2006
 - RWSL program became aware of red lights when a pilot responded to the REL survey stating that they presented a "mental conflict"



SAN REL Operational Evaluation Human Factors Surveys Overview

- Survey composition for pilots
 - 16 yes/no response statements, counterbalanced
 - Additional comments encouraged
- Survey methods supplied
 - Web site
 - Paper (placed near posters in Operations Centers)
- Survey methods used
 - Most pilots are using website



SAN REL Operational Evaluation Human Factors Surveys Results

- Favorable responses and understanding increased with more REL exposure
- Specific negative comments about
 - **REL timing that incorporates use of anticipated separation by ATC**
 - confusion with red lights on the runway centerline
- All questions were optional (some responses contained blank answers)
- Four key categories analyzed
- Comprehension
 - Do not cross red RELs
 - **REL off is not clearance**
- Effectiveness
 - **RELs functioning, visible, consistent with clearances**
- Acceptance
 - Situational awareness enhanced, RELs valuable and valid
- Suitability
 - - cockpit workload not increased, distinct from other lights



RWSL SAN REL Operational Evaluation Pilots Survey Statements - 1

Please check "Yes" or "No" to respond to the following statements.

#	Statement	Yes	No				
1.	If cleared to cross the runway, I will proceed through illuminated red Runway Entrance Lights.	0	С				
2.	I interpret Runway Entrance Lights turning off as clearance to proceed.	0	•				
3.	I have observed Runway Entrance Lights activate in response to traffic at least once.	0	С				
If you answered Yes to #3, go to #4. Otherwise, skip to #13.							
4.	I have seen Runway Entrance Lights activate on more than five occasions.	0	0				
5.	I found the Runway Entrance Lights were conspicuous enough to serve their intended purpose.	C	с				
6.	Runway Entrance Lights operation was consistent with my clearance.	0	•				
7.	My verbal response time to clearances increased due to Runway Entrance Lights.	0	С				
8.	My ability to complete normal cockpit duties was impeded by Runway Entrance Lights.	0	0				
9.	Runway Entrance Lights enhanced my situational awareness.	0	С				
10.	I thought that the Runway Entrance Lights were not functioning.	0	0				
11.	The Runway Entrance Lights were on when they should have been off .	0	с				
12.	The Runway Entrance Lights were off when they should have been on .	0	0				



RWSL SAN REL Operational Evaluation Pilots Survey Statements - 2

13.	I know of runway conflicts that Runway Entrance Lights would have helped.	0	С
14.	Runway Entrance Lights (along the taxiway centerline) can be confused with Runway Guard Lights (along the taxiway hold line).	•	0
15.	Runway Entrance Lights will help to reduce the number of runway incursions.	0	C
16.	I would recommend additional implementations of Runway Entrance Lights.	0	0

Any additional comments you have would be very helpful.

Please take a few moments to tell us about your flying experience. This section is strictly optional and will be used for analysis only.



RWSL SAN REL Operational Evaluation Pilots Survey Statements - 3

Question	Reponse
Employer:	Select an airline 💌
Total number of flight hours logged:	

Date:	
Time:	
Flight ID:	
Role:	 PF (Pilot flying) PNF (Pilot not flying)
Title:	 Captain First Officer Vehicle Operator
Duty:	 PIC (Pilot in command) SIC (Second in command) Instructor Pilot Cockpit Observer
Seat:	C Left C Right C Jump

Submit



SAN REL Operational Evaluation Feedback from Pilots

	Statement	Yes	No		34 respons	es to web surve	v on www.RWSI	net as of	
1.	If cleared to cross the runway, I will proceed through illuminated red Runway Entrance Lights.	0	0			8 Februa	ry 2007		
2.	I interpret Runway Entrance Lights turning off as clearance to proceed.	•	0						J
3.	I have observed Runway Entrance Lights activate in response to traffic at least once.	C	С			Preliminary Overall Pil	ot Responses		
If you	If you answered Yes to #3, go to #4. Otherwise, skip to #13.			040/-					
4.	I have seen Runway Entrance Lights activate on more than five occasions.	•	0	94%				92%	
5.	I found the Runway Entrance Lights were conspicuous enough to serve their intended purpose.	c	c	92%		91%			
6.	Runway Entrance Lights operation was consistent with dearance.	<u> </u>	0	90%					
6.	Runway Entrance Lights operation consistent with my clearance.	on wa	s o	88%			86%		
_	GMGI CI1633-		_	80%					
10.	I thought that the Runway Entrance Lights were not functioning.	0	0	840/-					
11.	The Runway Entrance Lights were on when they should have been off .	0	С	04 70	83%				
12.	The Runway Entrance Lights were off when they should have been on.	0	0	82%					
13.	I know of runway conflicts that Runway Entrance Lights would have helped.	C	0	000/					
14.	Runway Entrance Lights (along the taxiway centerline) can be confused with Runway Guard Lights (along the taxiway hold line).	•	•	80%					
15.	Runway Entrance Lights will help to reduce the number of runway incursions.	0	0	78% Co	mprehension	Effectiveness	Acceptance	Suitability	y
16.	I would recommend additional implementations of Runway Entrance Lights.	•	•	_			· · ·	-	
S	AN REL Survey Results - 14					F	Preliminary Resu MIT Lincoln	ults To 8 Feb 2 Laboratory	2007



SAN REL Operational Evaluation Amount of Pilots Exposure to RELs



Preliminary Results To 8 Feb 2007



SAN REL Operational Evaluation Effect of Pilots Exposure to RELs



Preliminary Results To 8 Feb 2007



SAN REL Operational Evaluation Analysis of Pilots Comments





SAN REL Operational Evaluation Sample of Positive Comments from Pilots

- I think these lights are a great idea because they are not on all the time and we don't get used to seeing them. They only come on when an aircraft is in the area. Keep up the good work!
- These lights are a great help in moving toward the goal of 0 incursions. Please keep adding them to ... MKE, BOS, LGA, EWR to name just a few.
- ... As this a/c crossed threshold the lights extinguished. Shortly tower cleared us in to position. System seemed to be working perfectly.
- I think that the RELs are very effective and serve their purpose well... however, for aircraft on final approach for landing, the THLs may give the intuitive appearance of a displaced threshold.
- ... the Captain and I reviewed the materials available concerning the operation of the REL system and I thought that their operation was excellent. They also made me more aware of traffic on final approach to Rwy 27 prior to my ability to see the landing lights of the arriving traffic. Keep up the good work and the enhancements to airport safety!
- Regarding the lights at B1 in SAN: they are very bright and flash at the proper cycles/minute to be very effective visual clues that the runway is in use and to stay off.
- I have been able to utilize these lights at SAN. I find them very helpful.
- I think it is a great tool.

SAN REL Operational Evaluation Sample of Negative Comments from Pilots - 1

- While waiting for takeoff observed lights turned on (red) too late, would not prevent a conflict.
- On takeoff the red centerline lights were on for my entire takeoff roll, no aircraft or vehicles were on or near the runway as far as I could tell. This presents a <u>mental conflict</u> as red lights are supposed to mean stop.
- Having lights at a few airports will tend to fuel complacency at airports without the system. I have found the system to be redundant to the required voice acknowledgement of hold short or position and hold.
- ... Just install red stop bars at each entrance to the runway, across the taxiway and in line with wag lights. ... make the same installation at every commercial airport mandatory. ... These lights should be manually operated by tower controllers; when they give clearance to cross, they flip the switch.
- These lights are good for SA, but in my opinion they would be more identifiable if they ran parallel to the hold short line. ... the lights do not appear to follow the curve so much as they simply look like a sea of lights.
- ...I found the lights to be on for too short of a time to be useful, they turn on too late, and turn off too early. The lights turn off at the approach end of 27 SAN too quickly, the approaching aircraft on final is not even close to the displaced threshold.

SAN REL Operational Evaluation Sample of Negative Comments from Pilots - 2

- I found the lighting NOT to be intuitive, in other words, most lights prohibiting entry or crossing would be perpendicular to the long axis of my airplane, whereas these were aligned with the airplane. But the red lighting still got the message across DON'T COME HERE
- My responses are based primarily upon my experiences with the system installed at the Chiangi Intl Airport in Singapore (SIN). I believe their system is superior to the ones being suggested/tested at SAN and DFW ... But any system of hold lights would be superior to the current lack of light systems. Apart from a set of lights the cross laterally across a hold line, a type of stop light like current Red-Yellow-Green stop lights for automobile traffic lights ... could be remotely controlled by RF from the tower ...
- The system works although I think you should tweek the system so the lights stay on until the aircraft on the runway passes by the intersection.
- ... They seemed to be more of a distraction than help.
- ... my one suggestion would be for the RELs to illuminate sooner (when an aircraft is further out than the approximate 1 mile)
- I would like to see better training for pilots on how the lights work.
- **RELS** turn off with traffic on short final to runway 27 ... a few seconds early, and not enough time for anyone to taxi onto the runway, but it was a little disconcerting for me considering my understanding of how they are supposed to work.

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- Surveys administered for all appropriate users at SAN during one Shadow Operations (to controllers) and one Operational Evaluation of RELs (to pilots) for specified periods from 5/2006 to present (2/2007)
- Surveys adapted from evaluation of RELs at the first test site, Dallas Fort Worth (DFW) Airport
- Survey statements, method, and analysis validated
- Survey feedback data was categorized into findings on comprehension, effectiveness, acceptance, and suitability
- More survey responses are expected especially from SWA pilots once the red runway centerline lights have been eliminated at SAN (to preclude any confusion between those red lights and red status lights)
- Survey results and analysis will be used to prioritize system improvements and assess operational suitability of RELs
- Surveys will be open throughout the REL operational evaluation period that began in December 2006 and is scheduled to continue for 90 days