Appendix B

Comparative Risk Assessment Form

SEC TRACKING No : This is the number assigned CRA Title : Title as assigned by the FAA SEC							
to the CRA by the FAA System Engineering Council			the us ussigned by		n i bi		
(SEC)							
	SYSTEM: This is the system being affected by the change, e.g. National Airspace System						
	REFERENCES: A short list or references. If a long list is used can be continued on a separate page.					.	
SSE INFORMATION							
SSE Name/Title: Location: Telephone No.:							
Name and title of person who Address and office symbol of							
performed or led team SSE SSE							
SUMMARY OF HAZARD CLASS (worst credible case; see List of Hazar		vidual rick acco	(semants)				
		Proposed Char					
			X: Place the highest risk assessment				
			Iternatives here.				
DESCRIPTION OF (Option A) BA	SELINE AND P						
Option A: Describe the syste				cussed	in cha	pter 2	
Describe the baseline (or no c							
appendix if it does not fit into	this area. Avoid	too much detail,	, but include enou	igh so t	that th	e	
decision-maker has enough in	formation to und	erstand the risk	associated with e	ach alte	ernativ	ve.	
			-11				
SEVERITY:							
1 CATASTROPHIC – Death, system	or aircraft loss, pe	ermanent total					
disability				DDC			7
2 HAZARDOUS - Severe injury or major aircraft or system damage				PRC) BAB	ILITY	(
3 MAJOR - Minor injury or minor aircraft or system damage		mage	SEVERITY	А	В	С	D
4 MINOR – Less than minor injury or aircraft or system dama		n damage	1				
5 NO SAFETY EFFECT			2				
PROBABILITY:			3				
A DEORABLE Likely to convering life	otime of each and	tom	4				
A PROBABLE - Likely to occur in lifetime of each system 4 (> 1E-5)			+				
B REMOTE – Possible for each item, several for		5	No 1	ick			
system (< 1E-5)		5 NO HSK					
C EXTREMELY REMOTE – Unlikely for item, may occur few in							
system (< 1E-7)							
D EXTREMELY IMPROBABLE – so unlikely, not expected in system		1				ĺ	
(<1E-9)		- •					

No.	Hazard Condition	RISK ASSESSMENT CODE (RAC)					
	List the hazard conditions here. Enter the risk assessment codes for each hazard – alternative to the right.	Baseline Option A	Option B	Option C	Option D	Option E	
1	Loss of communication between air traffic controllers and aircraft (flight essential)	1D	1D	1C	1C	1B	
2	Loss of communication between air traffic controllers in different domains (ARTCC to ARTCC, ARTCC to TRACON, etc.)	1D					
3	Loss of communication between air traffic controllers and flight service (flight plans, etc.)						
4	Loss of communication between air traffic & ground controllers and vehicles in the airport movement area						
5	Loss of the means for operator and flight service to communicate information relative to planned flight						
6	Loss of the capability to detect, classify, locate, and communicate adverse weather such as: thunderstorms, rain and snow showers, lightning, windshear, tornadoes, icing, low visibility or ceilings, turbulence, hail, fog, etc.						
7	Loss of navigation functions providing aircrew with independently determined 3D present position of the aircraft, defined routes, destination(s), and navigation solution (course, distance) to destination.						
8	Loss of Air traffic control determination of 3D location, velocity vector, and identity of each aircraft operating in a domain.						
9	Loss of Air traffic control determination of location, identity, and velocity vector of each participating vehicle operating in the airport movement area domain.						

10	Loss of approach guidance to runway. Precision – horizontal and vertical guidance; Non- precision – horizontal guidance, vertical procedures.			
11	Loss of ground vehicle or aircraft operator independent determination of present position, destination(s), and navigation solution on the airport movement area.			
12	Hazardous runway surface precludes safe takeoff or touchdown and rollout.			

SAFETY ASSESSMENT SUMMARY

(Conclusions/Recommendations)

Summarize your conclusions. Which option is best (and 2^{nd} , 3^{rd} , etc) and why. Include enough detail to appropriately communicate with the audience.

Recommendations: Provide additional controls to further mitigate or eliminate the risks. Follow the safety order of precedence, i.e., (1) eliminate/mitigate by design, (2) incorporate safety features, (3) provide warnings, and (4) procedures/training. See Chapter 4 for further elaboration of the Safety Order of Precedence). Define SSE requirements for reducing the risk of the design/option(s).

H	AZARD CLASSIFICATION RATIONALE Do one of these sheets for each hazard
1	Hazard: Loss of communication between air traffic controllers and aircraft
Summarization	Summarize the risk assessments for hazard No. 1 for each alternative that was examined.Baseline Option ASeverity: 1-CatastrophicProbability: E-ImprobableAssessment: Medium RiskOption BSeverity: NAProbability: NAAssessment: NA
Severity	 Rationale for Severity: In this section explain how you came up with the hazard severity. This is where you will convince the skeptics that you were logical and objective. The hazard is a component of the hazardous conditions required for NMAC, CFIT, WXHZ, NLA, and RIA's. For the baseline NAS system the severity of the 'loss of communication' hazard is highly dependent upon the environmental conditions surrounding the event and is therefore categorized as a flight essential function of the NAS. In a 'day, VFR, low density' environment the severity is very low resulting in minor effects. During a night/IFR high-density environment the occurrence of this hazard has a good chance of becoming catastrophic. The reason for this is that the purpose of this communication system is to provide aircraft in a region of airspace with direction, clearance, and other services provided by Air Traffic Control (ATC). In an environment of low outside visibility and many aircraft this function becomes critically important to air vehicle separation. The following points highlight the severity: Air Traffic Controllers (ATCs) are able to observe wide volumes of space using airspace surveillance systems. These systems enable the ATCs to observe the location, velocity, and sometimes the identity of the aircraft detected by their systems. The ATCs are trained to direct the flow of traffic safely to prevent midair collisions, flight following, approach clearances, and emergency assistance. Loss of the entire communication oxystem would result in the rapid onset of chaos as approaching aircraft attempt to land and enroute aircraft converge on navigation waypoints and facilities. The risk of mid air is high in these conditions. In the event that a loss of communication occurs, then complex emergency procedures are established for IFR and VFR aircraft. The procedures are necessarily complex and if followed should result in a safe landing, but once initiated can be difficult to follow esp

Rationale for Probability:

Probability

Use this section to explain how you derived the probability. This may be quantitative or qualitative. In general, the higher risk items will require more quantitative analysis than low or medium risk hazards. The example below is qualitative.

Many controls exist to preclude this hazard from occurring-

Multiple radios both in the aircraft and in the ATC facility provide redundant communication channels from aircraft to ATC.

In the event of failure multiple facilities can be used including FSS, other ARTCC, TRACON, or ATCC, even airborne telephones.

1. Planning systems assist in keeping aircraft at different altitudes or routes. Emergency procedures exist to ensure an aircraft in "lost communication" will not converge on another aircraft's flight path.

¹ Federal Aviation Administration. (1995). Airman's Information Manual. Para. 4-2-1.

Catastrophic	Results in multiple fatalities and/or loss of the system
Hazardous	Reduces the capability of the system or the operator ability to cope with adverse conditions to the extent that there would be: Large reduction in safety margin or functional capability
	Crew physical distress/excessive workload such that operators cannot be relied upon to perform required tasks accurately or completely
	 (1) Serious or fatal injury to small number of occupants of aircraft (except operators)
	Fatal injury to ground personnel and/or general public
Major	Reduces the capability of the system or the operators to cope with adverse operating condition to the extent that there would be – Significant reduction in safety margin or functional capability
	Significant increase in operator workload
	Conditions impairing operator efficiency or creating significant
	discomfort
	Physical distress to occupants of aircraft (except operator)
	including injuries
	Major occupant illness and/or major environmental damage, and/or major property damage
	Does not significantly reduce system safety. Actions required by
Minor	operators are well within their capabilities. Include
	Slight reduction in safety margin or functional capabilities
	Slight increase in workload such as routine flight plan changes
	Some physical discomfort to occupants or aircraft (except
	operators)
	Has no effect on safety
No Safety Effect	