

Doses Measured in Air Luggage

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Table 1 Trip Data			
Trip	Date	Dosimeters Checked	Dosimeters Carry-on
Las Vegas (1)	October 2006	4	0
Las Vegas (2)	June 2007	10	9
Las Vegas (3)	May 2007	0	10
Las Vegas (4)	June 2007	10	10
Oakland (5)	May 2007	10	10
Salt Lake City (6)	January 2007	1	0
<i>Totals</i>		35	39

Table 2
Dose Data
in units of rem
(checked luggage only)

Destination	Statistic	Deep	Shallow	Δ	Δ/D
Las Vegas (1)	Mean	0.373	0.395	0.022	0.059
	Std Deviation	0.011	0.029	0.023	0.061
Las Vegas (2)	Mean	0.341	0.349	0.009	0.026
	Std Deviation	0.011	0.008	0.010	0.030
Las Vegas (4)	Mean	0.446	0.451	0.005	0.012
	Std Deviation	0.023	0.017	0.010	0.025
Oakland (5)	Mean	0.165	0.170	0.004	0.028
	Std Deviation	0.019	0.015	0.007	0.048
Salt Lake City (6)	Mean	0.190	0.190	0.000	0.000
	Std Deviation	N/A	N/A	N/A	N/A
All Dosimeters	Mean	0.320	0.327	0.008	0.025
	Std Deviation	0.115	0.117	0.012	0.040
All Trips	Mean	0.303	0.311	0.008	0.025
	Std Deviation	0.121	0.125	0.009	0.022

Chart 1
Air Luggage Deep Dose
(shown with 1σ error bars)

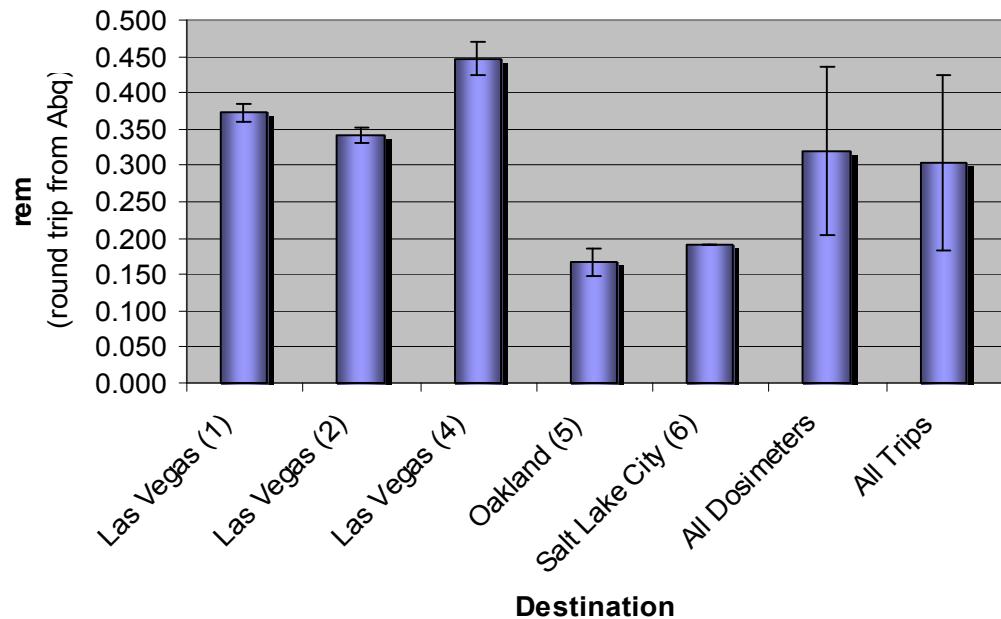


Chart 2
Air Luggage Shallow Dose
(shown with 1σ error bars)

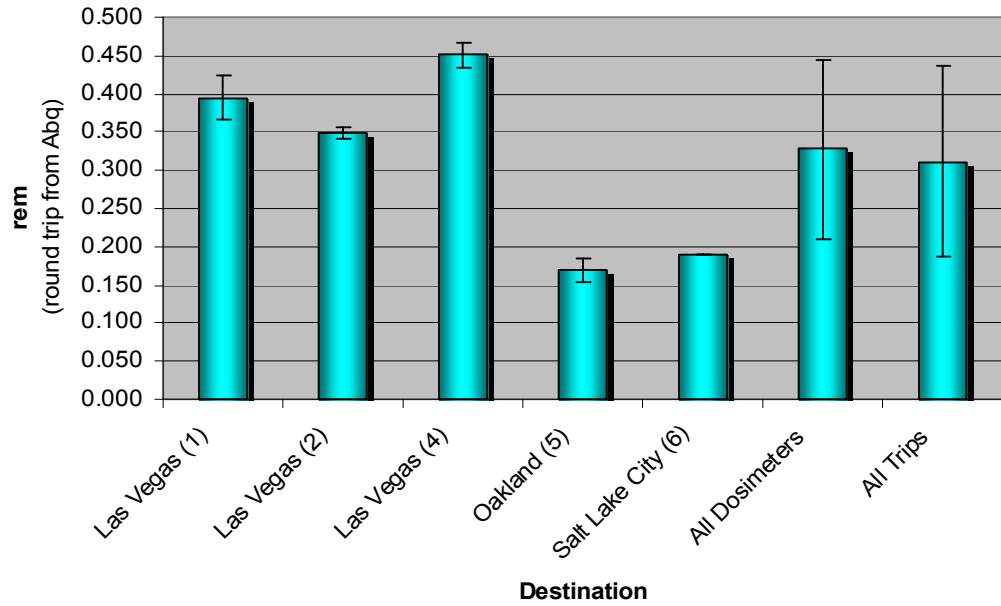
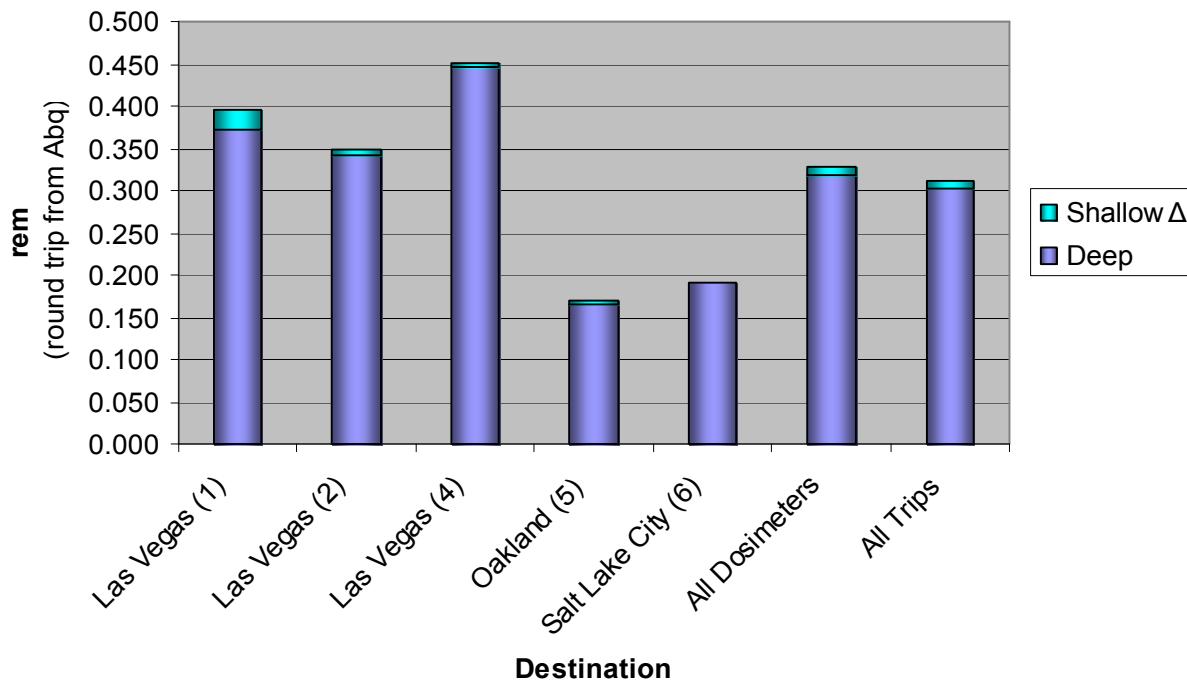


Chart 3
Air Luggage Deep and Shallow Dose
(shallow dose shown as shallow Δ above deep dose)



Conclusions

The following conclusions may be drawn from the data. The conclusions rest on the assumption that these trips are representative of domestic travel and of TSA examination protocols.

1. Dosimeters exposed to checked luggage examination by x-ray in domestic air travel may be expected to show deep dose in the range of a few hundred mrem. In this study, they showed an average of just over 300 mrem, in a range of 141 mrem to 487 mrem.
2. Such dosimeters may show a few percent of incremental shallow dose (Δ). In this study, the average difference between deep and shallow dose amounted to about 2.5 %, in a range of zero to 14.3%.
 - a. Note that the statistics for Δ may be affected to some degree by a standard industry practice called data censoring, wherein negative values of Δ are suppressed (treated as zero). This practice, standard in industry and endorsed by accrediting bodies including DOELAP, has the effect of introducing a positive bias to statistics based on censored data. Since the observed Δ in this study is so small, it may be substantially perturbed by this artifact; i.e., the true value may be closer to zero than shown in the data and conclusions.
3. Dosimeters exposed to hand-carry examination by x-ray in domestic air travel may be expected to show no detectable exposure. In this study, no hand-carry dosimeter showed results above the lower limit of detection (LLD) (10 mrem).