Airpower and Coercion in Counterinsurgency Wars: Evidence from Afghanistan (Supplemental Appendix)

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Abstract

This supplemental appendix describes additional robustness checks and alternative specifications for "Airpower and Coercion in Counterinsurgency Wars."

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1 Drones

Table A1 re-estimates Models 1-6 with a binary *Drones* variable that denotes whether an airstrike was conducted by a remotely piloted vehicle.

2 Placebo Test

Table A2 and Table A3 re-estimate Models 1-6 with two randomly drawn sample populations. Randomization was conducted with replacement.

3 Cross-Validation Using iMMAP (2008-11)

Table A4 re-estimates Models 1-6 using an independent dataset of insurgent and ISAF operations collected by iMMAP (1 January 2008 to June 2012, N=98,000).

4 Airstrike Effects by Data Source (CAOC, DAPS, and CIDNE)

Table A5 re-estimates Models 1-6 using each of the three components of the airstrike dataset separately.

5 Disturbance Terms

Table A6 uses Models 4-6 ("best matching") to re-estimate airstrike effects taking into account the possibility of additional airstrikes in the post-treatment window ("disturbances").

6 Additional Tests

6.1 Annual Subsets

Table A7 re-estimates Models 1-6 annually to test for period-specific effects.

6.2 With District-Level Covariates

Table A8 re-estimates Models 1-6 with five district-level covariates: dummy variables for districts bordering Pakistan and Iran; the number of aid projects run by NSP and CERP in these districts (as of 2006); the length of paved roads (in logged kilometers) in a district by 2006; and the presence of Taliban courts in the district (by 2006).

6.3 No Prior Insurgent Violence Versus Prior Insurgent Violence

Table A9 re-estimates Models 1-6 to explore whether villages without an insurgent attack in the specified pre-treatment window have different post-treatment levels of violence than villages already experiencing at least one insurgent attack in the pre-treatment window.

6.4 Ordered Logistic Regression

Table A10 re-estimates Models 1-6 with *Attacks* as an ordered dependent variable (Increase/No Change/Decrease) using ordered logistic regression.

Additional CIVCAS tests

6.5 All Covariates

Table A11 reports the results from the full 19 covariate model detailed in the paper. These regressions represent a "first pass" at the data that was then used to identify the statistically significant covariates for inclusion in a reduced form regression.

6.6 Alternative Measures of CIVCAS: Total Harmed (Low and High Estimates)

Table A12 re-estimates Table A11 using low and high estimates (logged) instead of a binary *CIVCAS* measure and the reduced form model used in the paper.

6.7 Interaction Terms

Table A13 examines two interactions—*CIVCAS*Compound* and *CIVCAS*History* to explore whether the effects of civilian casualties are conditional on also striking a compound (e.g., a residence) or the history of prior bombing.

[Figure 1 about here.]

Table A1: Are Drones More Effective than Other Aircraft?

Treatment Effect (ATE)	*Exact Matching*			*Best Matching*		
	7 day	45 days	90 days	7 day	45 days	90 days
Treatment	0.289***	0.682***	1.033***	0.371***	1.288***	2.339***
	(0.023)	(0.104	(0.184)	(0.033)	(0.150)	(0.265)
Drones	0.081	0.100	-0.281	0.131†	0.139	0.172
	(0.052)	(0.225)	(0.268)	(0.075)	(0.296)	(0.556)
Constant	0.974***	2.664***	3.296**	1.346***	6.245***	11.482***
	(0.201)	(0.711)	(1.058)	(0.255)	(1.123)	(1.808)
F stat	35.11***	11.89***	6.42***	40.72***	32.67***	36.72***
r^2	0.11	0.05	0.06	0.15	0.10	0.15
Treatment Coverage (%)	43%	29%	25%	60%	56%	53%
Villages (N)	4,600	3,544	3,122	5,395	5,017	4,879
Total N	7,670	5,156	4,390	10,574	9,888	9,404

Note: Models include all covariates. "Treatment coverage" refers to the percentage of total treatment cases used in the estimation. "Village (N)" refers to the combined number of treated and control villages. Exact matching was used for prior insurgent and ISAF violence, ISAF private information, troops in contact, and the primary language of the village's inhabitants. Best matching allows these covariates to "float" within $\leq .2$ standardized bias of one another. A 2km^2 radius was used in all models to delineate the calculation of pre- and post-insurgent violence. Robust standard errors clustered on individual villages. ***p=<.001, **p=<.01, *p=<.05, $^{\dagger}p$=<.10

Table A2: Placebo Test with Randomly-Assigned Airstrikes: Sample 1

Treatment Effect (ATE)	*Exact Matching*			*Best Matching*		
	7 day	45 days	90 days	7 day	45 days	90 days
Treatment	-0.003	0.02*	-0.004	-0.002	0.018	0.014
	(0.003)	(0.009)	(0.015)	(0.004)	(0.016)	(0.031)
Constant	-0.02	-0.144*	-0.027	0.019	0.019	0.139
	(0.023)	(0.07)	(0.106)	(0.024)	(0.098)	(0.199)
F stat	19.92***	18.83***	13.22***	11.56***	3.73***	10.07***
r^2	0.11	0.06	0.03	0.25	0.07	0.21
Treatment Coverage (%)	94%	90%	87%	97%	96%	96%
Villages (N)	13,687	13,174	12,857	14,080	14,059	14,000
Total N	16,590	15,892	15,426	17,156	17,024	16,936

Note: Models include all covariates. "Treatment coverage" refers to the percentage of total treatment cases used in the estimation. "Village (N)" refers to the combined number of treated and control villages. Exact matching was used for prior insurgent and ISAF violence, troops in contact, and a Pashtun binary variable. Best matching allows these covariates to "float" within $\leq$.2 standardized bias of one another. A 2km^2 radius was used in all models to delineate the calculation of pre- and post-insurgent violence. Robust standard errors clustered on individual villages. ***p=<.001, **p=<.01, *p=<.05, $^{\dagger}p$=<.10

Table A3: Placebo Test with Randomly-Assigned Airstrikes: Sample 2

Treatment Effect (ATE)	*Exact Matching*			*Best Matching*		
	7 day	45 days	90 days	7 day	45 days	90 days
Treatment	-0.004	0.004	-0.010	0.003	0.012	0.018
	(0.003)	(0.010)	(0.016)	(0.005	(0.017)	(0.035)
Constant	-0.004	-0.163**	-0.29*	0.03	0.003	0.052
	(0.024)	(0.06)	(0.116)	(0.024)	(0.110)	(0.225)
F stat	15.66***	21.03***	17.97***	8.62***	7.91***	11.10***
r^2	0.10	0.04	0.02	0.43	0.12	0.12
Treatment Coverage (%)	94%	87%	87%	97%	96%	96%
Villages (N)	13,639	13,233	12,796	14,122	14,027	13,987
Total N	16,652	15,962	15,436	17,172	17,004	16,926

Note: Models include all covariates. "Treatment coverage" refers to the percentage of total treatment cases used in the estimation. "Village (N)" refers to the combined number of treated and control villages. Exact matching was used for prior insurgent and ISAF violence, troops in contact, and a Pashtun binary variable. Best matching allows these covariates to "float" within $\leq$.2 standardized bias of one another. A 2km^2 radius was used in all models to delineate the calculation of pre- and post-insurgent violence. Robust standard errors clustered on individual villages. ***p=<.001, **p=<.01, *p=<.05, $^{\dagger}p$=<.10

Table A4: Cross-Validation using iMMAP Data: Airstrike Effects Over Days by Different Matching Procedures

Treatment Effect (ATE)	*Exact Matching*			*Best Matching*		
	7 day	45 days	90 days	7 day	45 days	90 days
Treatment	0.067***	0.093***	0.197***	0.079***	0.22***	0.315***
	(0.01)	(0.028)	(0.05)	(0.01)	(0.046)	(0.089)
Constant	-0.22*	-0.43*	-0.97**	-0.312**	-0.108	-1.36†
	(0.09)	(0.21)	(0.38)	(0.11)	(0.412)	(0.75)
F stat	7.97***	19.61***	10.51***	16.08***	12.62***	20.85***
r^2	0.11	0.08	0.04	0.25	0.12	0.11
Treatment Coverage (%)	79%	67%	61%	86%	83%	82%
Villages (N)	5,577	5,076	4,760	6,019	5,884	5,833
Total N	11,560	9,806	8,960	12,664	12,234	12,010

Note: Models include all covariates. "Treatment coverage" refers to the percentage of total treatment cases used in the estimation. "Village (N)" refers to the combined number of treated and control villages. Exact matching was used for prior insurgent and ISAF violence, troops in contact, and a Pashtun binary variable. Best matching allows these covariates to "float" within $\leq$.2 standardized bias of one another. A 2km^2 radius was used in all models to delineate the calculation of pre- and post-insurgent violence. Robust standard errors clustered on individual villages. ***p=<.001, **p=<.01, *p=<.05, $^{\dagger}p$=<.10

Table A5: Airstrike Effects by Data Source (CAOC, DAPS, and CIDNE)

Year	*Exact Matching*			*Best Matching*		
	7 day	45 days	90 days	7 day	45 days	90 days
CAOC	0.302***	0.708***	0.917***	0.405***	1.432***	2.516***
	(0.03)	(0.121)	(0.20)	(0.03)	(0.177)	(0.306)
DAPS	0.262***	0.664***	1.252***	0.35***	1.166***	2.322***
	(0.04)	(0.152)	(0.30)	(0.06)	(0.238)	(0.419)
CIDNE	0.27***	0.56***	1.393***	0.336***	0.911**	2.179***
	(0.05)	(0.11)	(0.333)	(0.073)	(0.297)	(0.523)

Note: Models include all covariates. Exact matching was used for prior insurgent and ISAF violence, troops in contact, and a Pashtun binary variable. Best matching allows these covariates to "float" within $\leq .2$ standardized bias of one another. A $2km^2$ radius was used in all models to delineate the calculation of pre- and post-insurgent violence. Robust standard errors clustered on individual villages. ***p=<.001, **p=<.01, *p=<.05, $^{\dagger}p$=<.10

Table A6: Disturbance Terms: Comparing Airstrikes Without and With Post-Strike Events Using Best Matching

Treatment Effect (ATE)	*No Disturbance*			*Disturbance*		
	7 day	45 days	90 days	7 day	45 days	90 days
Treatment	0.283***	0.671***	1.124***	0.338	-1.58	-2.571
	(0.032)	(0.114)	(0.191)	(0.888)	(1.852)	(2.138)
Constant	1.084***	4.169***	6.829***	9.095***	36.365***	51.053***
	(0.225)	(0.728)	(1.240)	(2.555)	(8.189)	(11.116)
F stat	39.77***	32.30***	34.42***	4.71***	11.39***	16.51***
r^2	0.19	0.14	0.19	0.12	0.11	0.18
Treatment Coverage (%)	55%	46%	43%	5%	9%	11%
Villages (N)	5,386	4,976	4,797	362	581	694
Total N	9,747	8,226	7,489	827	1,662	1,915

Note: Models include all covariates. "Treatment coverage" refers to the percentage of total treatment cases used in the estimation. "Village (N)" refers to the combined number of treated and control villages. Best matching allows these covariates to "float" within $\leq .2$ standardized bias of one another. A $2km^2$ radius was used in all models to delineate the calculation of pre- and post-insurgent violence. Robust standard errors clustered on individual villages. ***p=<.001, **p=<.01, *p=<.05, $^{\dagger}p$=<.10

Table A7: Subsetting of Airstrike Effects, by Year

Year	*Exact Matching*			*Best Matching*		
	7 day	45 days	90 days	7 day	45 days	90 days
2006	0.251***	0.516***	1.458†	0.281*	0.806	0.847
	(0.062)	(0.121)	(0.802)	(0.12)	(0.534)	(1.244)
2007	0.237***	0.395***	0.791***	0.321***	0.844**	1.318**
	(0.044)	(0.134)	(0.246)	(0.097)	(0.325)	(0.471)
2008	0.206***	0.393*	0.746*	0.214***	0.507†	1.625***
	(0.036)	(0.20)	(0.308)	(0.046)	(0.298)	(0.494)
2009	0.225**	0.851**	1.388*	0.399***	1.02**	1.876***
	(0.057)	(0.324)	(0.636)	(0.072)	(0.327)	(0.555)
2010	0.504***	1.22***	1.755***	0.626***	3.25***	5.58***
	(0.075)	(0.254)	(0.378)	(0.086)	(0.473)	(0.819)
2011	0.318**	0.616***	0.441***	0.431***	1.04***	1.57***
	(0.044)	(0.110)	(0.136)	(0.052)	(0.237)	(0.472)

Note: Models include all covariates. Exact matching was used for prior insurgent and ISAF violence, troops in contact, and a Pashtun binary variable. Best matching allows these covariates to "float" within $\leq$.2 standardized bias of one another. A 2km^2 radius was used in all models to delineate the calculation of pre- and post-insurgent violence. Robust standard errors clustered on individual villages. ***p=<.001, **p=<.01, *p=<.05, $^{\dagger}p$=<.10

Table A8: Models 1-6 with District Level Covariates

Treatment Effect (ATE)	*Exact Matching*			*Best Matching*		
	7 day	45 days	90 days	7 day	45 days	90 days
Treatment	0.282***	0.681***	0.986***	0.364***	1.236***	2.236***
	(0.025)	(0.127)	(0.216)	(0.054)	(0.291)	(0.511)
Constant	0.884***	2.02*	3.15*	1.25**	6.088***	11.102***
	(0.189)	(0.863)	(1.51)	(0.439)	(1.856)	(2.95)
F stat	26.51***	10.20***	3.08***	41.00***	3.24***	21.76***
r^2	0.11	0.06	0.06	0.15	0.10	0.15
Treatment Coverage (%)	43%	29%	25%	60%	56%	53%
Villages (N)	4600	3544	3122	5395	5017	4879
Total N	7,670	5156	4390	10,574	9888	9404

Note: Models include all covariates. "Treatment coverage" refers to the percentage of total treatment cases used in the estimation. "Village (N)" refers to the combined number of treated and control villages. Exact matching was used for prior insurgent and ISAF violence, ISAF private information, troops in contact, and the primary language of the village's inhabitants. Best matching allows these covariates to "float" within $\leq .2$ standardized bias of one another. A $2km^2$ radius was used in all models to delineate the calculation of pre- and post-insurgent violence. Robust standard errors clustered on individual villages. ***p=<.001, **p=<.01, *p=<.05, $^{\dagger}p$=<.10

Table A9: No Pre-Treatment Window Insurgent Attacks Versus Pre-Treatment Attacks

Year	*Exact Matching*			*Best Matching*		
	7 day	45 days	90 days	7 day	45 days	90 days
No Attacks	0..250***	0.426***	0.515***	0.277***	0.445***	0.556***
	(0.02)	(0.057)	(0.10)	(0.02)	(0.057)	(0.098)
Attacks	0.743***	1.620***	2.556***	0.730***	2.161***	3.69***
	(0.139)	(0.369)	(0.586)	(0.124)	(0.282)	(0.428)

Note: Models include all covariates. Exact matching was used for prior insurgent and ISAF violence, troops in contact, and a Pashtun binary variable. Best matching allows these covariates to "float" within $\leq .2$ standardized bias of one another. A $2km^2$ radius was used in all models to delineate the calculation of pre- and post-insurgent violence. Robust standard errors clustered on individual villages. ***p=<.001, **p=<.01, *p=<.05, $^{\dagger}p$=<.10

Table A10: Reestimating Models 1-6 Using Ordered Dependent Variable (Increase/No change/Decrease)

Treatment Effect (ATE)	*Exact Matching*			*Best Matching*		
	7 day	45 days	90 days	7 day	45 days	90 days
Treatment	1.23***	0.78***	0.71***	0.84***	0.57***	0.57***
	(0.08)	(0.07)	(0.08)	(0.06)	(0.046)	(0..05)
Cut1	-5.69	-2.56	-2.68	-2.30	-1.18	-1.13
Cut2	1.02	1.52	0.62	1.85	0.92	0.58
Wald χ	551.17***	322.46***	200.36***	417.49***	392.16***	364.87***
r^2	0.25	0.13	0.06	0.12	0.04	0.04
Treatment Coverage (%)	43%	29%	25%	60%	56%	53%
Villages (N)	4600	3544	3122	5395	5017	4879
Total N	7,670	5156	4390	10,574	9888	9404

Note: Models include all covariates. "Treatment coverage" refers to the percentage of total treatment cases used in the estimation. "Village (N)" refers to the combined number of treated and control villages. Exact matching was used for prior insurgent and ISAF violence, troops in contact, and a Pashtun binary variable. Best matching allows these covariates to "float" within $\leq$.2 standardized bias of one another. A 2km^2 radius was used in all models to delineate the calculation of pre- and post-insurgent violence. Robust standard errors clustered on individual villages. ***p=<.001, **p=<.01, *p=<.05, $^{\dagger}p$=<.10

Table A11: The (Non-)Effects of Civilian Casualties: Full Model

Covariate	*7 days*				*45 days*				*90 days*			
	CIVCAS only		Full Model		CIVCAS only		Full Model		CIVCAS only		Full Model	
CIVCAS	0.171	(0.105)	0.181	(0.151)	-0.349	(0.612)	-0.611	(0.482)	-0.763	(1.189)	-1.416	(0.902)
Treatment												
Compound			0.255**	(0.097)			0.817†	(0.505)			0.975	(0.833)
Building			0.187	(0.164)			0.064	(0.743)			-0.002	(1.379)
Farm			0.183**	(0.059)			0.618*	(0.323)			0.362	(0.590)
Roads			-0.083	(0.087)			0.206	(0.350)			0.727	(0.683)
Settlement			-0.094	(0.078)			-0.488	(0.388)			-0.815	(0.633)
HVT			0.032	(0.187)			0.979	(0.936)			2.124	(1.945)
Bombs			-0.018	(0.024)			-0.162†	(0.100)			-0.339†	(0.196)
Drone			0.099	(0.084)			0.619†	(0.341)			0.866	(0.642)
Dynamic												
TIC			0.813***	(0.062)			3.500***	(0.349)			6.445***	(0.554)
Season			0.247***	(0.053)			2.112***	(0.300)			3.314***	(0.528)
Prior Attacks			-0.523***	(0.023)			-0.522***	(0.029)			-0.571***	(0.033)
ISAF Ops			0.145*	(0.069)			0.223*	(0.095)			0.369***	(0.095)
Private Info			0.117	(0.095)			0.085†	(0.048)			0.104†	(0.063)
History			0.069***	(0.016)			0.398***	(0.104)			0.544***	(0.173)
Static												
Population			0.010	(0.027)			-0.002	(0.131)			0.041	(0.244)
Elevation			-0.365***	(0.084)			-2.203***	(0.468)			-4.624***	(0.707)
Neighbors			0.049**	(0.019)			0.429***	(0.088)			0.964***	(0.168)
Pashtun			-0.095	(0.104)			-0.890	(0.639)			-1.015	(0.934)
Constant	0.006	(0.026)	2.539***	(0.588)	-0.171	(0.131)	15.72***	(3.255)	-0.771**	(0.257)	32.303***	(5.027)
F stat	1.21		44.49***		0.32		33.02***		0.41		31.23***	
r^2	0.00		0.27		0.00		0.29		0.00		0.34	
Total N	8,854		8,854		8,854		8,854		8,854		8,854	

Note: These models incorporate all airstrikes, including 202 that inflicted civilian casualties. An additional 14 airstrikes that killed or wounded civilians were dropped because these events were marked by the use of both airstrikes and shows of force. Robust standard errors clustered on individual villages. A 2km^2 radius was used to calculate pre- and post-insurgent violence. Significance levels: ***p=<.001, **p=<.01, *p=<.05, $^{\dagger}p$=<.10

Table A12: CIVCAS, Alternative Measures: Minimum and Maximum Total Harmed (Killed + Wounded), Logged

Covariate	*7 days*		*45 days*		*90 days*	
	Low Estimate	High Estimate	Low Estimate	High Estimate	Low Estimate	High Estimate
CIVCAS	0.039	0.040	-0.103	-0.122	-0.267†	-0.280†
	(0.034)	(0.034)	(0.10)	(0.09)	(0.166)	(0.163)
Constant	2.73***	2.73***	14.78***	14.76***	32.41***	32.41***
	(0.692)	(0.691)	(3.733)	(3.730)	(5.568)	(5.566)
F stat	75.88***	75.86***	58.17***	58.40***	50.35***	51.06***
r^2	0.27	0.27	0.29	0.29	0.34	0.34
Total N	8,854	8,854	8,854	8,854	8,854	8,854

Note: These models incorporate all airstrikes, including 202 that inflicted civilian casualties. An additional 14 airstrikes that killed or wounded civilians were dropped because these events were marked by the use of both airstrikes and shows of force. Robust standard errors clustered on individual villages. A 2km^2 radius was used to calculate pre- and post-insurgent violence. Significance levels: ***p=<.001, **p=<.01, *p=<.05, $^{\dagger}p$=<.10

Table A13: Testing Interaction Effects: CIVCAS*Compound and CIVCAS*History

	7 day	45 days	90 days
CIVCAS*Compound	0.862†	0.182	1.059
	(0.504)	(1.415)	(2.559)
CIVCAS	-0.022	-0.593	-1.52*
	(0.106)	(0.376)	(0.676)
Compound	0.224*	0.697	0.786
	(0.095)	(0.517)	(0.856)
Constant	2.63***	15.03***	33.03***
	(3.742)	(0.691)	(5.611)
F stat	69.33***	54.04***	47.16***
r^2	0.27	0.29	0.34
Total N	8,854	8,854	8,854
CIVCAS*History	0.200*	0.144	0.416
	(0.094)	(0.030)	(0.649)
CIVCAS	0.333†	-0.437	-0.948
	(0.204)	(0.599)	(1.205)
History	0.072***	0.408***	0.587***
	(0.015)	(0.102)	(0.176)
Constant	2.63***	15.02***	33.01***
	(0.685)	(0.3.74)	(5.616)
F stat	69.06***	53.68***	58.17***
r^2	0.27	0.29	0.34
Total N	8,854	8,854	8,854

Note: Reduced form models used here. A 2km^2 radius was used in all models to delineate the calculation of pre- and post-insurgent violence. Robust standard errors clustered on individual villages. ***p=<.001, **p=<.01, *p=<.05, $^{\dagger}p$=<.10

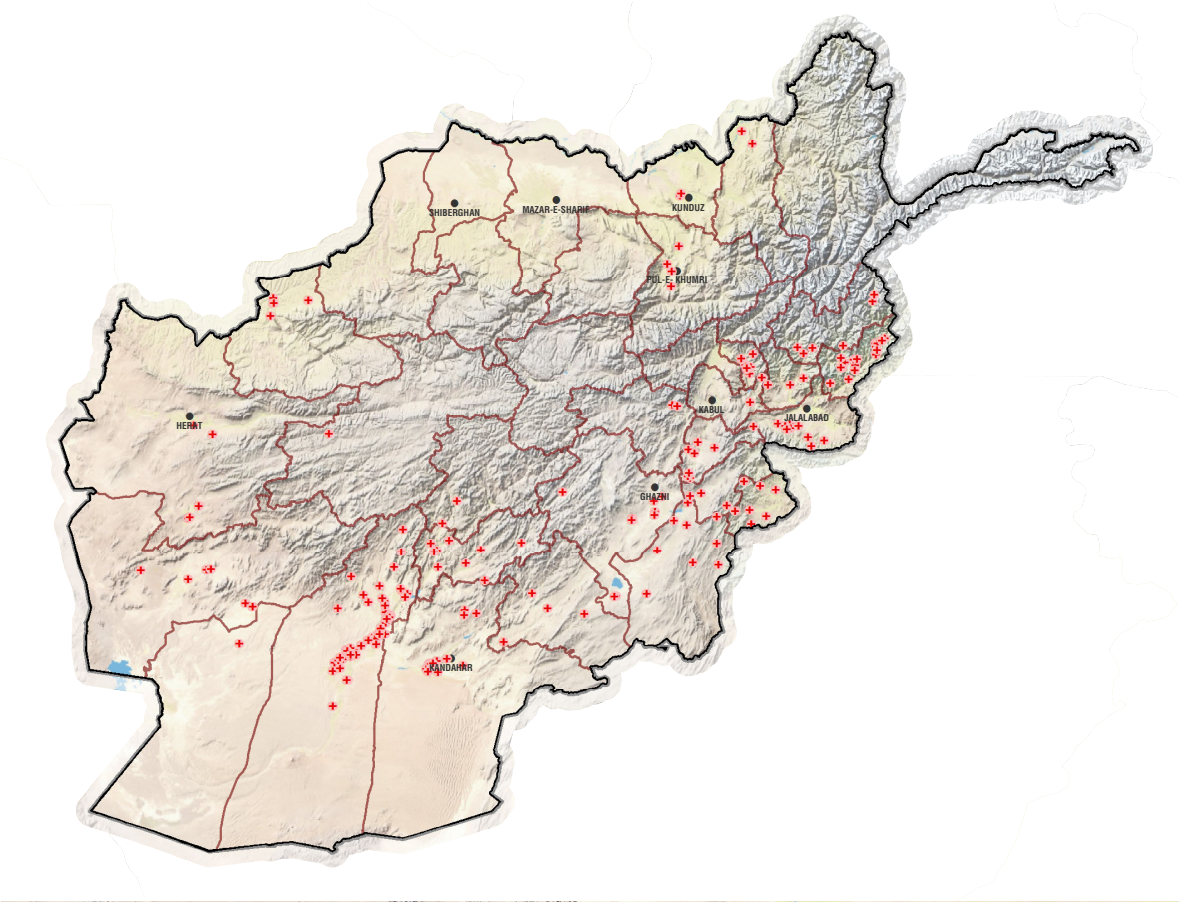

Figure 1: Location of Known Airstrikes Inflicting Civilian Casualties (CIVCAS), 2006-11 (N=216).