TABLE 2-11

COMPARATIVE COSTS F-5, F-5-21, F-4D (PER AIRCRAFT)
(In Thousands)

Aircraft	MAP 1/ Investment	MAP Operating (Overall)	Five Years of Ten-year Systems Cost 2/
F-5A 3/	$1,165.3	$ 69.4	$ 929.4
F-5-21	1,845.3	82.4	1,337.1
F-4D 4/	2,878.1	152.9	2,203.5

1/ With prorata share of Aerospace Ground Equipment (AGE), spare engines and initial spare parts.

2/ Five-year cost is five times annual operating costs plus one-half investment cost.

3/ The MASL price for the F-5A is $836,000; however, this study has utilized a $900,000 price for the F-5A as portrayed in the Weapons Dictionary. The latter price is considered to represent a more realistic projection of future costs as the F-5 production line nears completion.

4/ While the MASL price for the F-4D is $1,969,000, the Air Force has recently made one FMS offer for the aircraft at $1.7 million. The current Weapons Dictionary cost for the F-4E replacement is $2,825 million for FY 1970. Therefore, this Study has retained the $1,969 million flyaway costs for the F-4D.

Adoption of the F-5-21 would increase FY 70-74 US costs under each alternative(savings realized by replacing F-4Ds in Alternatives C and D are more than offset by the higher costs associated with substituting large numbers of F-5-21s for F-5s in these alternatives). Some reduction in ROKAF operating costs would accrue with all of the alternatives except B. MAP and ROK costs associated with the F-5-21 are summarized in Table 2-12 on the next page.

A detailed cost summary for each alternative appears in Table 6-1 on page 251.

TABLE 2-12

FY 70-74 COSTS FOR ALTERNATIVE ROKAF FORCES WITH F-5-21 Option
(Million $ US)

	ALT A (JSOP)	ALT B	ALT C	ALT D	ALT E (MAP 74)
MAP Investment (FY 70-74)	195.9	336.9	295.8	606.7	152.7
MAP Investment (Prior Years)	51.1	51.1	51.1	51.1	51.1
MAP Operating Costs	136.3	150.2	150.5	162.6	82.3
Subtotal: MAP Costs	383.3	538.2	497.4	820.4	286.1
ROKAF Operating Costs	178.7	215.9	203.9	241.5	107.0
Gross Budget Costs	562.0	754.1	701.3	1061.9	393.1
(Net Budget Costs FY 70-74 only)	510.9	703.0	650.2	1010.8	342.0

BUDGET COST CHANGES WITH F-5-21
(Million $ US)

	ALT A (JSOP)	ALT B	ALT C	ALT D	ALT E (MAP 74)
MAP Aircraft Investment (FY 70-74)	+85.2	+47.1	+96.5	+62.7	+80.9
MAP Operating Costs	+6.0	-3.2	+7.7	-13.8	+8.2
Subtotal MAP Costs	(+91.2)	(+43.9)	(+104.2)	(+48.9)	(+89.1)
ROKAF Operating Costs	-6.8	+2.2	-0.4	-2.3	-4.6
TOTAL BUDGET COSTS	+84.4	+46.1	+103.8	+46.6	+84.5

2.5 Support Aircraft

In each of the alternatives, improvements in support aircraft have been included in developing the alternative ROKAF improvement programs. However, the need for all this support aircraft falls below that for the combat aircraft. Accordingly, some might be dropped from the programs. Eleven different helicopter

and fixed-wing aircraft types are included for anti-submarine warfare, rescue, helicopter airlift, training, and utility missions. Introduction of such a variety of aircraft, especially complex types such as ten CH-3 helicopters (MAP investment and five-year operating costs estimated at over $14 million), is not consistent with the stated objective of standardizing and simplifying ROKAF assets in order to contain maintenance and logistical problems. Alternatives B, C, and D include 163 miscellaneous aircraft costing $40 million for investment and $19 million for five years of operation. Some of these aircraft are relatively inexpensive -- O-1s, for example, cost $30,000 -- and the importance of the mission each is intended to perform varies considerably. Support aircraft intended for airlift, training, tactical control, and special operations are discussed further below.

With respect to Special Operations, increased capability could be achieved by providing from one to three squadrons of A-37 jet aircraft at a FY 70-74 cost of about $14.3 million per squadron (25 acft). Twenty existing ROKAF T-28s might also be modified and retained for the Special Operations mission at a more nominal cost. Finally, a squadron of sixteen AC-119K gunships might be employed for DMZ patrol, flare /fire support, and detection of seaborne infiltrators at a five-year cost of $9.1 million. All of these aircraft types could be operated effectively against ground targets (assuming a permissive air environment) from relatively primitive airfields. This would place little additional burden on the existing airbase infrastructure. Overall investment and operating costs for Special Operations varies from about $1 million with the present MAP (T-28s only) to almost $53 million under Alternative C (75 A-31s, 16 AC-119Ks and 20 T-28s).

Airborne forward air controllers (FACs) play a vital role in locating ground targets of opportunity and directing air strikes against them. The ROKAF has no capability to perform this mission at present. Thirty-six Cessna O-1s, costing $2.1 million for acquisition and operation, might be provided to give the ROKAF this tactical control capability. These airplanes could also perform visual reconnaissance and civic-action missions.

Improved airlift could be acquired by phasing-out existing C-46s in favor of C-119s. Alternatively, C-123 aircraft might be considered to enhance ROKAF airlift. However, this type is in short supply world-wide and needed to replace attrition losses in Vietnam and MAP countries already equipped with C-123s. C-119s, in contrast, are readily available from current assets. Costs for providing C-119s range from $15.5 million for 27 aircraft with the MAP plan, to $41.4 million for 72 aircraft under Alternatives B and D.

The ROKAF now has twenty T-28s for training purposes. As mentioned above, these airplanes could be modified and inexpensively employed in the Special Operations role. The ROKAF also has some F-5Bs, and from 20 to 30 additional T-38/F-5B jet trainers are included in the force alternatives along with 14 O-1As. Provision of T-38s for advanced training would cost $30-45 million. O-1s transferred from current assets would have five-year operating costs of about $.6 million.

SECTION 3: AIRFIELD AND BASING POSTURE

3.1 Summary

The airfield system in the Republic of Korea presents a concentrated and vulnerable series of targets. This is partly a result of terrain, which yields few adequate airfield sites in South Korea. It is also a result of the relatively small investment which has been made in developing an airbase infrastructure. During the Korean War, when USAF units were moved to Korea it was necessary to make emergency preparation of several airfields. Construction problems, complicated by Korean topography and a critical shortage of time, left little choice other than rehabilitation of the Japanese-built airfields which had been designed to accommodate lighter aircraft, and did not have adequate sub-surface stabilization, runways or taxiways. Although there has been some improvement, essentially the same airbase structure is serving the ROKAF today.

In addition to the US base at Osan, there are five jet-capable airfields with runways of 8,000 feet or more. Marginal jet-capable facilities exist at five other locations with runways varying from 5,800 to 7,400 feet. An air facility with a 5,600 asphalt runway is located just outside Seoul, but is used only for liaison and support aircraft. There are eight other small airfield facilities located throughout South Korea with runway lengths in the 3,400 to 4,800 foot range. A description of South Korean airfield facilities appears in Table 3-1. The cost of improving this situation is discussed in detail in Section 5.

3.2 Airfield Vulnerability

Airfield Location. Three of the ROKAF jet airfields are located close to the DMZ and are consequently especially vulnerable to surprise attack. Kimpo, Osan, and Suwon, which together comprise about half of the tactical jet airfield capability, are within 35 miles (approximately five minutes jet flying time) from the DMZ. Because of this proximity to enemy territory, even a sophisticated radar warning system would not be capable of providing enough advanced tactical warning to scramble much more than the alert force. To reduce the danger of our aircraft being destroyed on the ground, the tactical jet main operating base (MOB) airfields might be relocated further south. Under this concept, the northern bases, with revetments, hardening and strengthened point defense, would be employed on a rotational aircraft basis.

Airfield Density. There are only six airfields in the ROK which are fully capable of tactical jet operations and there is presently a dangerous concentration of aircraft at these relatively undefended airfields. The density of aircraft also limits operational capability and reaction time. Airfield density of alternative ROKAF forces, without construction of additional airfields and without substantial US air augmentation, is indicated in Table 3-2.

TABLE 3-1

SUMMARY OF AIRFIELDS IN THE ROK

Airfield	Runway[1]	Capability
Kimpo	8100A	Tactical jet
Suwon	9000C/8226A	Tactical jet/ALOC[2]
Osan	9000C	Tactical jet/ALOC
Kwangju	9300C	Tactical jet/ALOC
Kunsan	9000C/8100A	Tactical jet
Taegu	9038C	Tactical jet
Kangnung	7380A	Marginal jet/ALOC
Kimhae	7000A	Training/Marginal jet/ALOC
Pusan	6600A	Marginal jet/ALOC
Pyongtaek	5800C	Marginal jet/ALOC
Pohang	6500A	Marginal jet/ALOC
Seoul	5650A	ALOC/C-130/utility
Hoengsong	4800A	ALOC (C-130)
Pupyong	4200A	ALOC (C-130)
Chinhae	4100A	ALOC (C-130)
Sachon	4000A	ALOC (C-130)/Special Operations)
Chunchon	3500A	ALOC (C-130)
Sokchori	4200A	Utility
Samchok	4200A	Utility
Taejon	3400A	Utility

1/ "A" indicates "Asphalt"; "C" indicates "Concrete" runways.
2/ "ALOC" - air line of communication.

TABLE 3-2

AIRCRAFT BASING DENSITY
(Normal Posture with Existing Airfields)

	ROKAF					NKAF
	ALT A (JSOP)	ALT B	ALT C	ALT D	ALT E (MAP 74)	Estimated 1974
Jet-operational airfields	6	6	6	6	6	10
Total useable airfields 1/	11	11	11	11	11	17
Tactical jet aircraft 2/	261	321	341	465	264	425
Total aircraft (all types) 2/	367	580	564	734	336	525
Tactical jet aircraft per jet-operational airfield	44	54	57	78	44	42
Tactical jet aircraft per useable airfield	24	29	31	42	24	25
Aircraft (all types) per useable airfield	33	53	51	67	31	31

1/ Includes marginally jet-capable airfields but not ALOC airfields or utility fields unsuitable for tactical operations (runway less than 5,000 feet).
2/ Includes illustrative US deployment of 48 aircraft.

Under Alternatives A and E, the basing density for tactical jets is about equal. There is heavy concentration, particularly of tactical aircraft, and this increases vulnerability, decreases reaction time, and allows little room for introduction of air augmentation. Under Alternative D, the basing density is excessive and could be safely achieved only by improving dispersal areas. Alternatively, construction of additional airfields would be necessary just to accommodate ROKAF forces; moreover, current USAF studies indicate that a capability to deploy a mobility package to Korea ranging from 576 to 990 tactical aircraft could be needed. This implies crowding and high vulnerability unless additional airbases are constructed (or dispersal areas improved - see Table 3-3 below). Part of the tactical force along with some supporting aircraft could be located in Japan, Okinawa, or on CVAs in the Sea of Japan.

TABLE 3-3
ROK BASING DENSITY WITH US AIR AUGMENTATION
(with existing airfields)

	ALT A (JSOP)	ALT B	ALT C	ALT D	ALT E (MAP 74)
Total Useable Airfields	11	11	11	11	11
Total Aircraft (all types) with US Augmentation of 576/990 Acft.	943/1357	1156/1570	1140/1554	1310/1724	912/1326
Aircraft (all types) per useable airfield	86/124	105/143	104/141	119/157	83/121

3.3 Basing Posture

On the basis of the conditions assumed above, there may be a need for additional jet airfields in the ROK. There was objectionable aircraft concentration with the deployment of 180 USAF aircraft to Korea after the PUEBLO incident. The JCS are currently studying detailed base developments designed to achieve a less vulnerable positioning of the force and to provide a reduction of average base loadings at certain locations selected for optimum tactical advantages. Included in this study are basing requirements for contingency US air augmentation.

Tactical Jet Airfields. In view of the vulnerability of ROK airfields and the density of US/ROKAF aircraft, airfield construction programs have been considered to provide additional dispersal capability. It is possible that "bare bases" could be located and constructed according to a master plan, and if necessary later developed to fully operational tactical jet airfields. The ROKAF tactical airfield capability should be improved before any ROKAF modernization or increase in aircraft strength is undertaken.

Upgrading of Existing Bases. Upgrading existing bases would contribute to solving some of the airfield problems. Several fields which are located well south of the DMZ and have the potential for rapid and relatively economical upgrading to jet capability are already programmed for improvement. However, in most cases funds have not been available to meet these requirements. Consideration should be given to upgrading Sachon and Kimhae along with improvements at Kangnung (for all alternatives) and Taejon and Pohang (for Alternatives B,C and D).

Air Line of Communication Airfields. In addition to the tactical airfield requirements, there is a need for a viable air line of communication (ALOC) across Korea. There is the nucleus of an ALOC in Korea which, with improvement, could increase the capability to provide air support to US and Korean forces. Additional basing to be considered for normal operations and US air augmentation is summarized in Table 3-4.

TABLE 3-4

AIRFIELDS ASSOCIATED WITH ROKAF ALTERNATIVES [1/]

Description of Requirements	ALT A (JSOP 74)	ALT B	ALT C	ALT D	ALT E (MAP 74)
New Jet MOBs	3	2	1	4	3
New DOBs	0	2	2	2	0
Upgrade existing bases to jet capability	0	2 [2/]	2 [2/]	2 [2/]	0
Improve selected existing bases for a viable ALOC	3	3	3	3	3 [3/]
	($ in Millions)				
Construct Jet MOBs at $53 million each	$159.0	106.0	53.0	$212.0	$159.0
Construct DOBs at $12.8 million each	-	25.6	25.6	25.6	-
Upgrade bases to provide jet or marginal jet capability	-	15.3	15.3	15.3	-
Improved selected bases for a viable ALOC	8.2	8.2	8.2	8.2	8.2
TOTAL	$167.2	$155.1	$103.1	$261.1	$167.2

1/ Does not include costs for shelters, POL hardening and basic airfield improvement costs to the overall ROK airfield structure as defined in COMUSKOREA construction review.

2/ Upgrade to 9,000 runway with jet capability.

3/ Not included within present MAP which encompasses no new airbases.

Aircraft basing density with the airfield improvements outlined in Table 3-4 for each alternative ROKAF force structure is shown below.

TABLE 3-5
ROK BASING DENSITY
(with airfield improvements shown in Table 3-4)

	ALT A (JSOP 74)	ALT B	ALT C	ALT D	ALT E (MAP 74)
ORMAL POSTURE					
Jet operational airfields 1/	9	12	11	14	9
Total useable airfields 2/	14	15	14	17	14
Tactical jet aircraft 3/	261	321	341	465	264
Total aircraft (all types) 3/	367	580	564	734	336
Tactical jet aircraft per jet operational airfield	29	27	31	33	29
actical jet aircraft per useable airfield	19	21	24	27	19
Aircraft (all types) per useable airfield	26	39	40	43	24
ITH US AUGMENTATION					
Total aircraft(all types) with US augmentation of 576/990 aircraft	943/1357	1156/1570	1140/1554	1310/1724	912/1326
Aircraft(all types) per useable airfield	67/97	77/105	81/111	77/104	65/95

/ Includes new DOBs where applicable.
/ Includes marginally jet-capable airfields but not ALOC airfields or utility fields unsuitable for tactical operations (runway less than 5,000 ft.).
/ Includes illustrative US deployment of 48 aircraft.

SECTION 4: AIR DEFENSE

4.1 General

The effectiveness of an air defense system is measured by its ability to limit damage to friendly forces. One way this can be done is by attriting attacking aircraft with manned interceptors, area coverage ADA missiles, or terminal point defenses composed of guns, or missiles, or both. All these means of attrition require some warning time to be employed successfully. Other "passive" air-defense measures (such as dispersal, hardening, and target camouflage) are equally desirable in reducing the damage likely to be sustained by friendly forces. When a prospective aggressor confronts a formidable defense which makes uncertain his returns and costs if he attacks, then the probability that he will attack is diminished.

Air defense of Korea has been provided by the US and ROK jointly. The area coverage system consists of ROK HERCULES and HAWK surface-to-air missiles (SAM) with US Army units reinforcing. The areas covered by these missiles include all the major ROKAF airfields as shown in Figure 4-1. Currently there are almost 1700 ADA missiles in Korea (over 600 on launchers) that could be employed against an air attack if given sufficient warning. The ROKAF also has 200 jet fighters which could be committed to air defense missions (see ROKAF AOB, Appendix C). These ROK forces are reinforced by US air forces: The USAF temporarily deployed 151 jet fighters to Korea to augment the ROKAF after the increased tensions of January 1968. This USAF augmentation will probably be reduced (see Section 7).

The development of an effective air defense for the Republic of Korea during the FY 1970-74 period hinges largely upon our ability: (1) to harden targets so they are less vulnerable to attack, e. g., provide complete shelters and camouflage for all ROKAF airbases; (2) to strengthen the gun defenses at ROKAF airfields in order to attrite attacking NKAF aircraft thus reducing the subsequent threat; and to a lesser extent, (3) to secure early warning through improvement of existing radar and communication facilities. Nevertheless, a really effective defense against a surprise attack will never be possible because of the limited flying time between North Korea and the DMZ.

4.2 The Threat

The NKAF capability to attack the south is not great, even though it has a large number of aircraft. Most of these aircraft were designed for air defense — the MIGs, which comprise over 85% of the inventory, are armed primarily with air defense type weapons. As MIG-15/17s are replaced by all-weather MIG-21s, ground attack capability is further diminished. This defense orientation of the NKAF is also reflected in the extensive hardening of their airfields -- underground hangars, shelters and so forth -- as compared with the relatively

open ROKAF fields. To obtain some idea of the magnitude of this air attack threat, we have looked at two NKAF attack options: (1) standing-down for 12-15 days prior to the attack thereby achieving maximum attack sortie rates, but at the risk of being detected and alerting ROK air defenses; (2) attacking without a stand-down thus assuring surprise, but with a markedly reduced sortie rate. In view of the fact that the jet flight time from the vicinity of the DMZ, or the southernmost NKAF airbases, to three of the major ROKAF airfields is not more than 10 minutes, the value of a surprise attack could be great. Assuming that about 70% of the NKAF could be committed to a surprise attack, the maximum sortie rates that might be realized during 1974 are shown in Table 4-1.

TABLE 4-1

1974 Attack Sorties for Initial Five Days

Aircraft Type	Number Possessed	Number Attacking	Sortie Rate 1st Day		Sortie Rate 2nd to 5th Days		Total Sorties	
			With Stand-down	Without Stand-down	With Stand-down	Without Stand-down	With Stand-down	Without Stand-down
MIG-21	375	262	2.7	1.65	2.0	1.65	2803	2165
MIG-17	50	35	2.7	1.8	2.0	1.8	374	315
IL-28	60	42	1.1	1.1	1.1	1.1	231	231
Total							3408	2711 1/

1/ The maximum number of NKAF attack sorties should remain at about the same level throughout 1970-74. However, the MIG-21/17 inventory mix could increase from 75 MIG-21s and 350 MIG-17s in 1970 to that shown in Table 4-1 by 1974 (see Section 1 for further discussion of Communist air threat).

The North Koreans could use this sortie capability in a number of ways in order to inflict damage on the ROKs. For example, in conjunction with a ground attack, the NKAF might attempt to inflict casualties on ROK ground units. In order to alleviate the damage that might follow from such an attack we have made some damage projections using the latest weapons effectiveness data available. The probability of target destruction for NKAF sorties is indicated below, assuming the most effective Soviet ordnance now in the USSR/Warsaw Pact inventory were used by the NKAF.

TABLE 4-2

PROBABILITY OF TARGET DESTRUCTION FOR SOVIET MUNITIONS DELIVERED BY TACTICAL JET AIRCRAFT
(P_k per sortie)

	500 lb. Bomb		57mm Rocket		Cluster Bomb 3/		2x23mm 1000rpm Guns	Napalm 3/ (290 lbs.)	
	2 pods	4 pods	2 pods	4 pods	2 pods	4 pods		2 pods	4 pods
Land Force Targets									
Prsnl in Foxholes 30x300 Meters 30% Casualties	.014	.023						.17	.27
Light Tank(K=kill)	-	.01	.01	.02	.05	.08		-	-
Medium Tank (K)	-	.01	.01	.01	.04	.07		-	-
Gun Howitzer (Firepower Kill)	.03	.06	.01	.02	.06	.10		-	.01
Air Force Targets									
Aircraft in Open (K)	.10	.19	.25	.38	.21	.29	.18	.03	.06
Runway cut	7.4 1/	4.8 1/							
Large Hangar(50% Damage)	.02	.03							
Masonry Bldg 40' x 40' (50%)	.03	.05							
Interdiction Targets									
Girder Bridge(drop 1 span)	8 bombs 2/ = .01								
Masonry Arch Bridge (Drop 1 span)	.005	.01 2/							
1.5 Ton Truck(K)	.01	.02	.01	.02	.05	.09		.09	.17
Rail Cut	.19	.27 2/							
Radar Van (F)	.21	.34	.43	.60	.07	.10		.13	.24
Ammo Dump (K) (235'x347')								.05	.08

1/ Avg. No. of passes with 1000 lb. bombs.
2/ 1000 lb. bombs.
3/ These munitions are not believed available now in the NKAF inventory.

We do not know how the NKAF would allocate its sorties, that is, what priorities it would assign to counter-air, interdiction, or close air support given kill probabilities similar to those in Table 4-2. Nevertheless, the value of various components of an air defense system can be indicated even if only a hypothetical situation is developed. To do this, we have assumed that the NKAF attacks are focused on ground units, e.g., that the NKAF is committed to close air support. The relative effectiveness of ROK air defense systems against other NK strategies would be about the same, as will become clear from the logic of the analysis.

The number of targets the NKAF could destroy, assuming no ROK air defense, is indicated below in Table 4-3. To simplify the presentation, only six target categories were used; personnel and other targets in the vicinity of the primary targets would also become casualties or be damaged. Anti-aircraft artillery can reduce these casualties in several ways: First, when small caliber AAA weapons are firing at attacking aircraft, higher, safer release altitudes are required. Damage estimates were recalculated using new kill probabilities, assuming that the NKAF pilots keep above 1000-2000 ft. Second, with less optimum attack conditions, NKAF pilots would misidentify targets, or fail to position their aircraft for a clear shot. Based on US experiences in Vietnam, these factors reduce effective sorties 30%. This 30% reduction factor is, however, subject to change pending results of further analysis. Third, total sorties are reduced due to attrition from anti-aircraft guns. An attrition rate of 2.5% was used; it is equivalent to early US experience in North Vietnam and would probably be achieved, as a minimum, against NKAF pilots on their first close support mission in a combat environment. The resultant degradation in the NKAF attack capability is shown in the third column of the table.

TABLE 4-3

EFFECT OF MINIMAL KOREAN AIR DEFENSE TACTICS IN REDUCING DAMAGE FROM MAXIMUM NKAF 1974 AIR ATTACKS ON ROK LAND FORCES 1/
(Targets destroyed in five days of operations)

Target Description	Sorties Allocated(%)	No Air Defense	AAA Defense	AAA Defense; Strikes on North	AAA Defense; Strikes on North; Air Intercept
Bunkers	25	36	8	6	4
Mortars/Howitzers	20	55	20	16	10
Tanks	35	100	22	17	12
Armored Vehicles	5	3	3	2	2
Trucks	5	10	2	1	1
AAA Sites	10	--	7	5	4
Total		239	62	47	33
Total Attack Sorties 2/		3570	3180	2610	1735

1/ Kill factors used were obtained from the JMEM for one F-4 pass, the optimum dive angle, airspeed, and release altitude, and using a MK-82 500 lb. GP bomb or 2.75" rockets, whichever is better for the target.

2/ MIG-21 equivalent sorties for 5 days, including unsuccessful missions.

The ROKAF could probably reduce further the damage expected from an NKAF attack in two ways: (1) the ROKAF could retain a "second-strike" capability which would threaten targets North Korea considers valuable; to guard these targets, the North Koreans would probably keep some of their best NKAF aircraft for air defense or on air patrol; (2) the ROKAF could threaten to engage the incoming NKAF attack aircraft. In that case, as a matter of prudence, the NKAF air attacks would require a screen of escorts, thus diverting MIGs from attacking ground targets. If the NKAF were to adopt tactics used by the US over North Vietnam, they would require at least two air cover sorties for four attack sorties.

The consequent degradation in the NKAF air attack potential these ROKAF options might provide is indicated in the last two columns in Table 4-3. An air strike threat reduced damage expectancy another one-quarter. The 18 F-4s now programmed for Korea could furnish this threat, if adequately protected in shelters so they can strike back after a surprise attack. More F-4s, of course, would certainly enhance this ROK threat, but large improvements in ROKAF strike capability might lead to early NKAF requests for Soviet SU-7s. A potent interceptor force reduced damage expectancy another one-quarter. These assessments are relevant to the judgments on the adequacy of various ROK modernization proposals reached in the remainder of this section and in Section 2 above.

4.3 Air Defense Systems for Korea

Battle Zone and Area Defense: The overall ADA missile strength in Korea is slightly greater than that in Europe (7th Army), after adjusting for the greater air attack threat faced in Europe. Korea has an identical number of HAWKS on launchers (432), 90 fewer HERCULES, and 283 fewer REDEYE. Overall, Korea has 628 missiles on launchers against a possible threat of about 900 fighters and 240 bombers (including 700-800 CHICOM aircraft) -- .55 missiles per threat aircraft. The 7th Army has .51 missiles on launchers to oppose each aircraft in the expected European threat of 1,600 fighters and 290 bombers. Considering that the European threat could be up to three times as great as expected, while the Korean threat cited approaches the "worse case", it is clear that Korea is better defended by missiles than is the 7th Army, even allowing for non-US (NATO) SAMs which might happen to be in the 7th Army's area. US and ROK Army units have the following air defense missiles (see Figure 4-1 for deployment):

TABLE 4-4

AIR DEFENSE MISSILES

	Batteries	Launchers	Missiles on Launchers	Missiles on Site
US HERCULES	6	54	54	120
US HAWK	16	96	288	576
ROK HERCULES	4	36	36	72
ROK HAWK	8	48	144	288
US REDEYE[1/]	106 teams	106	106	636
TOTAL			628	1690

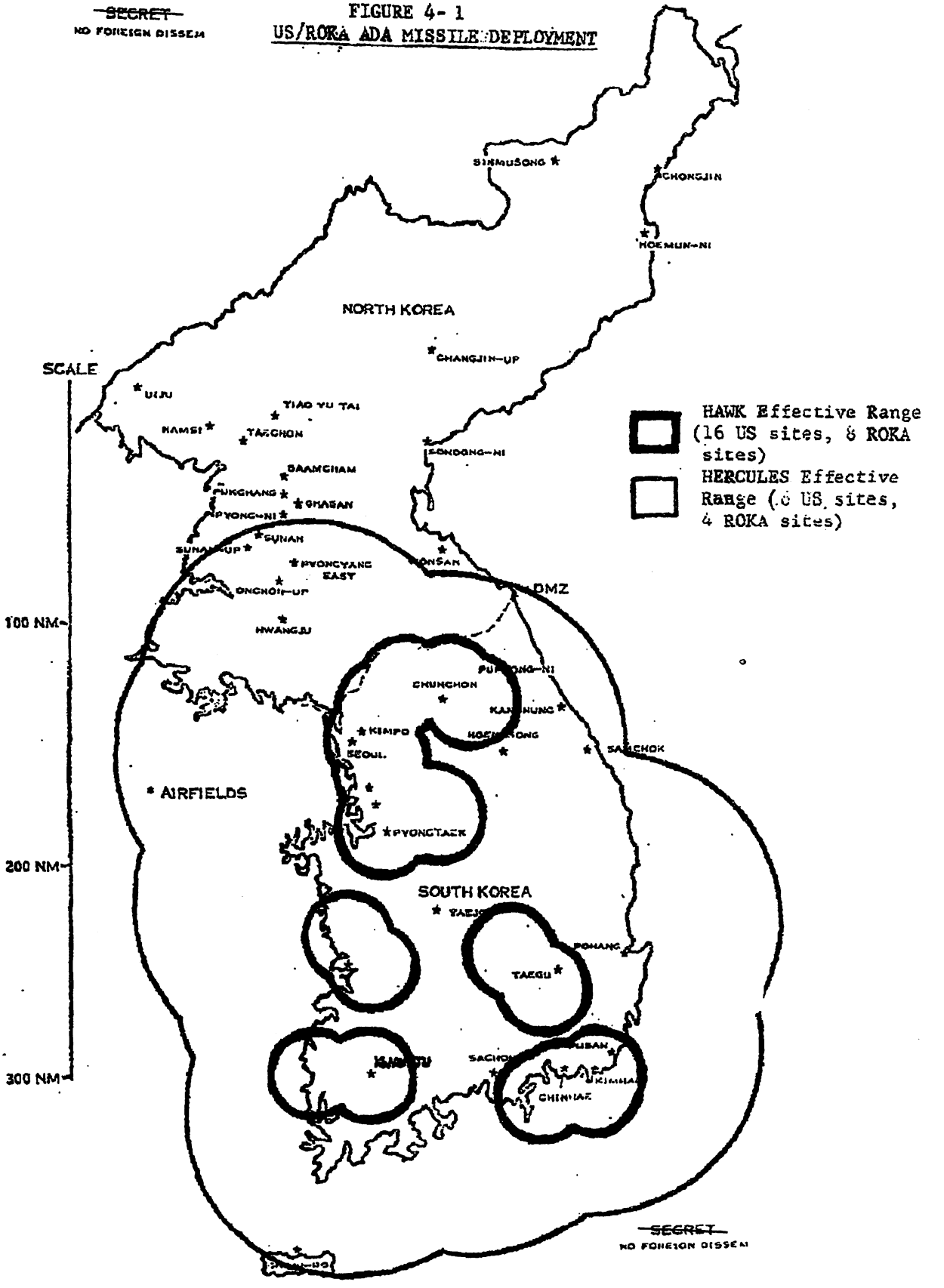
An additional reserve of 576 HAWK and 15 HERCULES missiles are stored in Korean depots.

1/ REDEYE is a manportable, shoulder-launcher air defense guided missile system. 106 two-man REDEYE teams are currently authorized US forces in Korea. Each team has a basic load of six rounds for a total 8th Army load of 636 tactical REDEYE missiles. Counting reserves, 8th Army allocation is 1,272 rounds of REDEYE missiles.

The ROKs are concerned about possible NKAF air attacks on ground forces. As was suggested above, the NKAF close air support threat would not destroy many ROK ground targets. (In Chapter II we said it increases ROK land requirements by only 1/3 division.) Nevertheless, to reduce the probability that specific important land targets such as command posts would be destroyed, some improvements to the ROKA air defense posture might be contemplated. Taking air defense of the 7th Army area as a guide, we could consider furnishing REDEYE, additional M-42 (Dusters), and improved HAWK to the Koreans. If US

~~SECRET~~
NO FOREIGN DISSEM

FIGURE 4-1
US/ROKA ADA MISSILE DEPLOYMENT



~~SECRET~~
NO FOREIGN DISSEM

defense units in Korea are reduced, additional ROKA HAWK units would be needed (see Chapter II, Sections 4, 5 and 6). Alternative defense systems for ground forces are included in Table 4-11.

Terminal Airbase Defense: Airbases always present high value targets to air attack. Therefore, after hardening efforts now underway have been completed, further measures to shelter friendly aircraft, particularly newer models, will be appropriate. Also, a ROKAF capability to exact a high toll on attacking aircraft through use of air defense guns relative to the damage they are able to inflict on ROKAF bases is important. In the Korean environment, characterized by patchy radar coverage and short warning time, terminal defenses employing automatic weapons could be an effective way to attrite attackers.

Our own experience over North Vietnam shows that the large majority of aircraft succeeds in reaching their targets, and most of our losses occurred over targets. From January 1965 through March 1968, about 80% of our aircraft combat losses over North Vietnam were caused by ground fire from anti-aircraft artillery and automatic weapons; our losses to SAMs and MIGs were only 11% and 9% respectively (see Table 4-5 below). In fact, our traditional reliance on area coverage missiles rather than point defense guns is not consistent with our own loss experience over North Vietnam.

TABLE 4-5

USAF FIXED WING COMBAT LOSSES BY CAUSE (NORTH VIETNAM)
(In Percent)

	1965	1966	1967	1968 (thru Aug)	Overall (1965-1968)
MIG	3.7%	4.7%	11.6%	33.3%	9.0%
SAM	6.1	10.5	14.8	11.1	11.0
Ground Fire	90.2	84.8	73.6	55.6	80.0

There are a variety of air defense systems in Korea now. The ROK Army has eleven light air defense artillery batteries deployed throughout South Korea: 48 towed single barrel 40mm guns, 48 M-55 quad .50 caliber machine guns, and 80 older M-16 quad .50 caliber guns. These types of weapons are easily operated and maintained, inexpensive, and effective against low altitude penetrators and dive bombers.* US Army forces in Korea are not presently equipped with automatic guns for air defense; however, seven batteries have been requested along with three VULCAN-CHAPARRAL battalions and two additional HAWK battalions. The ROKA has none of the twin 40mm DUSTER weapons discussed in this study.

* Similar weapons employed by Egyptain troops inflicted 3-5% attrition on attacking Israeli jets.

Sixteen ROKA 40mm ADA guns were deployed to four airfields after the PUEBLO incident -- a terminal defense capability did not previously exist at these ROKAF facilities. Two of the major ROKAF airbases, Kwangju and Taegu, remain without point defense weapons. These bases are, however, at extreme range for NKAF fighters and are afforded some defense by the more forward bases and by area coverage missiles. The current distribution of ROKA terminal defense weapons is shown in Table 4-6 below. For South Korean airfields, a more balanced defense would employ twin 40mm guns in a ratio of two for each M55 quad .50 caliber (16 M42s and 8 M55s per airbase).

TABLE 4-6
ROKA ADA/AW DEPLOYMENT FOR LOW ALTITUDE AIRFIELD DEFENSE

Location	ADA (40mm guns)[1/]	AW (Quad .50 Cal Machine guns)
Kimpo	0	24
Suwan	8	22
Osan	4	26
Kunsan	4	24
TOTAL	16	96

1/ The 40mm guns now possessed by the ROKA are towed single barrel weapons inferior to the M-42 DUSTER.

In attempting to estimate requirements to defend an airfield with a 9,000 foot runway, dispersal parking and overrun facilities, it should be pointed out that an area with a perimeter of about 9,500 meters must be protected. Depending on the terrain, this might be done with either 12-16 VULCANs, 12-16 CHAPARRALs, or a combination of 10-16 DUSTER twin 40 mm guns and 8 quad .50 caliber machine-guns (to provide triple overlapping fire at any one attacking aircraft).

Effectiveness, absence of a basic weapons cost (other than reconditioning) and facility of maintenance and operation are factors favoring the familiar 40 mm/.50 caliber guns over more complex alternatives for ROKA point air defenses.* Deployment of M-42 DUSTER guns with supporting M-55s appears preferable in any of the alternative force structures to deployment of M-61 VULCANs. Although M-42/M-55 guns are not perfect substitutes for the longer range CHAPARRAL, this system has also been omitted from the alternative forces because of its high investment cost ($16.5 million per airbase) relative to anticipated returns. The comparative costs of providing air defense for each ROK airbase are shown in Table 4-7.

* In tests conducted during the summer of 1965 at Fort Bliss, Texas, an M-42 DUSTER with improved gunsight, turret controls and ammunition out-performed a VULCAN 20mm gun throughout the range spectrum. (See Office of the Project Manager, Interim Air Defense System, Hq US Army Materiel Command, August 1965). In more recent tests, VULCAN was able to achieve higher kill probabilities out to a range of 1200 meters. Past this range, VULCAN effectiveness fell off abruptly and DUSTER scored higher P_ks out to 2000 meters (see: Executive Summary Report, OMSRADS for DA OACSFOR, May 1968).

TABLE 4-7

COMPARATIVE COSTS FOR TERMINAL AIR DEFENSE OF ONE ROK AIRBASE

(Thousand $ US)

CHAPARRAL (16 Units)		VULCAN (16 Units)		M42/M55 (16 Twin 40mm/8 Quad .50 Cal Guns)	
Investment Costs		Investment Costs		Investment Costs	
Carriers (sixteen units with two units for maintenance fillers)	$ 5,197.6	Fire Unit & Carrier (16 units and two units for maintenance fillers)	$ 3,438.0	Gun, 40 mm (16) (Reconditioning at 20% of acquisition value)	$ 297.1
Missiles (288)	3,948.8	FAAR Radar (5)	949.2	Gun, Calibre .50 (current assets)	--
Training Missiles	44.1	Displays	73.2	Radio sets - all types	144.7
FAAR Radar (5)	949.2	Organizational maintenance sets, shop equipment, tool kits, etc.	225.0	Trucks and support equipment	233.0
Rapid Alert Displays	73.2	Initial Repair parts	440.0	Other support equipment	57.5
Organization, maintenance test sets, shop equipment, tool kits, etc.	1,301.4	Ammunition (Initial):		Accessorial costs	307.4
Initial Repair Parts:		Tactical at $3.51/round	1,404.0		
Carrier equipment	1,195.4	Training at $1.875/round	631.8		
Radar and other equipment	1,326.5	Accessorial	1,145.8		
Accessorial costs	2,245.9	Initial cadre training (CONUS)	220.2		
Initial cadre training (CONUS)	226.3				
TOTAL Investment Costs	$16,308.4	TOTAL Investment Cost	$ 8,527.2	TOTAL Investment Costs	$829.7
Annual Operating Costs		Annual Operating Cost		Annual Operating Costs	
MAP Costs:		MAP Costs:		MAP Cost	
Mission operating material, central support, and depot material maintenance	$ 819.7	Mission operating material, training ammunition, central support and depot materiel maintenance	615.1	Mission operating materiel, training ammo, etc.	331.2
ROKA Budget Costs:		ROKA Budget Costs:		ROKA Budget Costs	
Local civilian labor maintenance costs	86.1	Local civilian labor maintenance cost	67.5	Military personnel and O&M costs (295 military personnel including support personnel)	161.0
Military personnel and O&M costs (436 military including support personnel)	238.1	Military personnel and O&M costs (383 military including support personnel)	216.7		
(Subtotal: ROKA Costs)	(324.2)	(Subtotal: ROKA Costs)	(284.2)	(Subtotal: ROKA Costs)	(161.0)
TOTAL Annual Operating Costs	$ 1,143.9	TOTAL Annual Operating Costs	899.3	TOTAL Annual Operating Cost	$492.2
GRAND TOTAL FY 70-74 Costs	$22,227.9	GRAND TOTAL FY 70-74 Costs	$13,023.7	GRAND TOTAL FY 70-74 Costs	$3,290.7

Although M-42 guns are no longer listed in the MASL as being available for MAP programming, the 11 January 1969 Land Forces DPM portrays the planned phase-down of Active and Reserve 40mm batteries during the 1969-74 period. These weapons might be used to meet the airfield defense requirements in Korea. The projected phase down schedule is shown in Table 4-8.

TABLE 4-8
PHASE-DOWN IN US M-42 (40mm) GUN BATTERIES

	FY 69	FY 70	FY 71	FY 72	FY 73	FY 74
Active Forces	16	5	2	2	2	2
Reserve Forces	56	40	28	16	16	16

M-55 quad .50 caliber weapons are readily available from present inventory and up to eight of these guns would also be emplaced at each of the ROKAF airfields.* This weapon will also provide additional counter-insurgency protection.

One problem, a possible shortage of spare parts for the 40mm gun motor carriage (M-41 tank chassis) may inhibit Duster's capability to provide active troop support toward the end of the 1970-74 period. Since mobility is not a prime requirement for weapons defending airbases, this limitation will not seriously affect the use of DUSTER for point air defense.

ROKA personnel are experienced with 40mm and .50 caliber weapons and a logistics base has been established for both. The ROKA already has some M-55s, and experience gained with existing 40mm weapons would ease the transition to M-42 DUSTERs so that minimal US assistance would be needed to introduce these weapons.

Turning to the air defense of AC&W sites, further protective improvements should include passive defense measures (tone-down, revetments, protected cables, etc.). An additional method for raising the cost to attacking NKAF aircraft would be to emplace up to four 40mm and two .50 caliber weapons at each of the AC&W sites. If they were installed, these weapons would also provide a measure of security against possible ground attacks.

* Until 1955-56, the distribution of 40mm and .50 cal. weapons was based on equal numbers of each weapon. A normal air defense battery was composed of eight sections with one 40mm and one .50 cal weapon each. The current 40mm battalion organized for Vietnam includes 64 40mm weapons supported by one battery of quad .50 guns. The latter weapons are used largely in perimeter defense.

Although the current airfield defense doctrine employs a battery of HAWK missiles in conjunction with low altitude point defenses, additional HAWK batteries ear-marked solely for airbase defense are not included in this study pending consultation with the COMUSKOREA staff to ascertain the location of any new ROKAF airfields. The COMUSKOREA requirement for an additional HAWK battalion has also not been reflected in any of the alternatives due to its high investment costs (about $29.8 million exclusive of accessorial costs). Finally, no requirement to furnish REDEYE specifically for airfield defense is recognized. The dispersion and in-depth deployment doctrine for REDEYE would not be appropriate for the point defense of ROKAF airfields.

This emphasis on air defense artillery at ROKAF airfields is also consistent with our experience over North Vietnam and the damage expectancy projection in paragraph 4.2 above. Since the magnitude of the US air effort against NVN was much greater than the maximum Communist effort that could be directed against South Korea (given the limited air-to-ground capability of MIGs), fewer guns are required to defend ROK targets than were employed by the North Vietnamese. The July 1968 disposition of ADA weapons around major North Vietnamese airfields is indicated below; the strong emphasis placed on point ADA weapons by the Communists is not meant to imply that we must match these numbers to defend ROK airbases against the NKAF.

TABLE 4-9

NORTH VIETNAM ANTI-AIRCRAFT GUN DEFENSES, 1968

Location	1 Mile Radius	5 Mile Radius
Phuc Yen	97	106
Gia Lam (Hanoi)	82	428[1/]
Bac Mai (Hanoi)	83	428[1/]
Cat Bi (Haiphong)	49	248
Kien An (Jaiphong)	53	248
Kep	99	99
Yen Bai	181	181

1/ Other high-value target complexes are nearby -- not all guns are used exclusively for airfield defense.

Also based on USAF experience over North Vietnam, the point gun defense posture recommended for the ROKAF airfields is expected to provide an indirect return in the degradation of NKAF attack profiles -- psychological reaction to intense ground fire may cause attacking aircraft to prematurely release or jettison their ordnance, or abort the mission.

We may expect low altitude automatic weapons fire to be more effective against MIGs than it proved against our aircraft over Vietnam. The smaller payload of MIGs compared to our aircraft suggests that they would be forced to rely more upon strafing. This consideration, plus their need to achieve greater accuracy against hardened ROKAF airbases, necessitates a lower attack profile (200-400 feet above ground for strafing) and increases their vulnerability to 40mm/.50 cal weapons.

The FY 1970-74 costs for point air defenses at ROK airbases and AC&W sites under each alternative ROKAF force structure are summarized in Table 4-10 below. Each AC&W site would be defended by 4 M-42 twin 40mm weapons (DUSTER) and 2 M-55 quad .50 caliber machineguns while each airbase would be alloted 16 M-42s and 8 M-55s. In addition to defending existing jet-capable bases, bases upgraded to MOB standards, and new MOBs, the table assumes we would also provide sufficient guns to permit the defense of dispersal bases in the event they are activated.

TABLE 4-10

POINT AIR DEFENSES FOR ALTERNATIVE ROKAF POSTURES
(Costs in Million $ US)

	Alt A 1/ (JSOP)	Alt B	Alt C	Alt D	Alt E 1/ (MAP 74)
Main Operating Bases	9	11	10	13	9
Dispersal Bases	0	2	2	2	0
AC&W Sites	8	8	8	8	8
Number of Weapons (twin 40mm/Quad .50 Cal)	176/88	240/120 2/	224/112 2/	272/136 2/	176/88
MAP Investment Costs 3/	9.1	12.4	11.6	14.1	9.1
MAP Operating Costs	18.2	24.8	23.2	28.1	18.2
ROKA Budget Costs 4/	13.7	18.6	17.4	21.1	13.7
TOTAL COSTS	41.0	55.8	52.2	63.3	41.0

1/ Point air defense guns are not now included in JSOP or present MAP.
2/ Includes extension to Kangoung.
3/ 40mm guns reconditioned at 20% of acquisition costs, .50 cal guns from current assets.
4/ Includes 54% allowance for appreciation in personnel costs over the next five years.