Chapter 12

Packages of Systems and Capabilities for Attacks of Follow-on Forces

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Chapter 12

Packages of Systems and Capabilities for Attacks of Follow-On Forces

In the special report on FOFA,[1] OTA observed that systems ought to be procured so as to form complete "packages' that perform all of the functions to support operational concepts (such as those described in ch. 6). These packages could include both existing systems as well as new developments such as those discussed in chapters 10 (RSTA) and 11 (weapons). This chapter illustrates how packages could be built to underwrite the operational concepts outlined in chapter 6.

Several factors complicate any attempt to specify what these packages might or should be for attack of follow-on forces:

- There are a great many potential packages—many operational concepts, several choices of systems for certain functions, and many ways of mixing systems for each function.
- Packages may evolve over time, as new systems are deployed.
- Many choices are subject to complex cost-effectiveness trade-offs, particularly for systems in development.
- Some systems will have considerable "flexibility," or application over abroad range of concepts, and can contribute to several packages.
- Many systems will have important applications-to missions other than FOFA.[2]

The particular packages discussed below are chosen to illustrate the major issues of development and procurement, and are *not* intended to be "preferred' or "recommended. A more complete analysis of packages for FOFA is in appendix 12-A.

The flexibility of systems for FOFA is especially important. Flexibility would allow the battlefield commander to use the best operational concept for a particular tactical situation—for example, to strike deeper against a division, and then to strike closer in against the weakened regiments of the division, rather than always having to strike either deeper or closer in.

Unfortunately, the use of many system names and acronyms is unavoidable in the discussion below and in the appendices; a glossary of system names and acronyms is provided at the end of this volume.

[1] U.S. Congress, Office of Technology Assessment, *Technologies for NATO* Follow-On Forces Attack Concept—Special *Report, OTA-ISC-312* (Washington, DC: U.S. Government Printing Office, July 1986).

[2] Multi-mission capability is likely to be the most common case; these "general purpose forces" are acquired for the inherently unpredictable needs of tactical warfare.

ILLUSTRATIVE CAPABILITY PACKAGES FOR FOFA

Table 12-1 presents capability packages for FOFA. Each package implements a given operational concept (listed in the first column), and consists of systems to perform the various necessary functions (listed in the remaining columns). For example, the first package implements artillery attack of regiments that are moving forward from final assembly areas, within about 30 kilometers of the FLOT.[3] This package includes a suite of systems for reconnaissance and surveillance and situation assessment (R&S/SA), two systems for target acquisition and attack control (TA/AC), two types of platforms (or launchers), and two possible

[3] *See* ch. *6* for a description of this operational concept.

Table 12-1.—Summary of Selected Packages for Attack of Follow-on Forces

OPERATIONAL CONCEPT	RECONNAISSANCE, SURVEILLANCE & SITUATION ASSMNT	TGT ACQ & ATTACK CONTROL	PLATFORM	WEAPON	SUPPORT
ARTILLERY ATTACK REGIMENTAL COLS[a] 5-30 KM	GR/CS +TRS + ASARS +J(S)TARS[b] +ASAS	AQUILA + AFATDS	MLRS +8-INCH	MLRS/TGW + SADARM	—
STANDOFF AIR ATK[c] DIVISION COLUMNS[a] 30-80 KM	GR/CS +TRS +ASARS + J(S)TARS + ENSCE	JS(TA)RS[d] + WIU	— F-16	MSOW + SKEET/TGSM[e] +CEB	PLSS +ATACMS
MISSILE ATTACK DIVISION COLUMNS 30-80 KM	GR/CS +TRS + ASARS +J(S)TARS +ASAS	JS(TA)RS + AFATDS	MLRS	ATACMS +SKEET/TGSM + DPICM	—
AIR ATTACK CHOKPT+ HLTD UNIT[f] 80-150 KM	GR/CS +TRS +ASARS +J(S)TARS + ENSCE	ASARS +GACC	F-15E + F-16	GBU-15 + MSOW + CEB/MINES	PLSS +ATACMS
CRUISE MISSILE ATK RAIL NETWORK 350-800 KM	ACTIVITY CUE —	(ON WPN)	B-52	CALCM-X[g] +GPS/TERCOM + RAIL MINES[a]	—

NOTES: Acronyms used here are defined in the Glossary at the end of this volume.
[a]REGIMENTAL COLUMNS and DIVISION COLUMNS are targets for attack when they are moving on roads after exiting assembly areas
[b]J(S)TARS denotes the MTI surveillance capability of Joint STARS
[c]STANDOFF AIR ATK denotes air attack from standoff of 25-50 km, using a weapon such as the MSOW (Modular Standoff Weapon) now under study in NATO.
[d]JS(TA)RS denotes the target acquisition and attack control capability of Joint STARS.
[e]SKEET/TGSM denotes the use of either sensor. fuzed weapon or terminally-guided submunition technology, or both, fOr anti-armor munitions
[f]CHOKPT + HLTD UNIT is a target in the concept where a chokepoint is created by attack (e.g. dropping a bridge) just prior to the arrival of an enemy unit, which, when halted behind the chokepoint, is then itself attacked
[g]CALCM-X denotes a conventionally-armed air-launched cruise missile, possibly ALCM-B retired from SIOP duty and modified to have less range with more payload
[h]RAIL MINE denotes a mine t. damage track and derail moving trains, possibly based on a modified ant! -bunker munition and a Mk-75 fuze

SOURCE Off Ice of Technology Assessment, 1987

weapons. No particular support measures are required for the first package; other packages, which use tactical aircraft that penetrate enemy airspace, require support for that function. Each of these illustrative packages is discussed below.

Overall, several features of this table stand out. One is the recurrence of the *suite of systems for R&S/SA.* A suite of this type is essential to many different packages, and has broad flexibility for FOFA (as well as for other missions). Another feature is *the recurrence of certain systems* in the table. For example, Joint STARS appears four times for R&S/SA, and twice for TA/AC. This is an example of system flexibility for FOFA. A third feature is the *number of different platforms and weapons* that can contribute to packages for FOFA.

Command and Control

To the extent that these packages for FOFA represent new capabilities for which command and control (C^2) procedures have not been developed, they will generate new requirements for C^2 activity and for processing of information. The discussion of the packages below assumes the capability to process and communicate data as needed. These capabilities may prove to be very difficult to provide, and could be critical to successful FOFA operations. Fail*ure to successfully develop the necessary data processing and communications capabilities could greatly reduce the capabilities of the RSTA/platform/weapons packages.* In this case, failure to spend enough resources (especially budget and personnel) on the C^2 part of the problem would greatly reduce the value of the much larger investments in equipment and munitions.

Locating Moving Combat Units

The first three of the packages in table 12-1 are for attacking moving columns of combat units. These packages, as well as the fourth,

depend on a capability to detect, locate, and track moving combat units (regiments and divisions) to a depth of at least 150 kilometers beyond the FLOT, and benefit from an ability to distinguish them from resupply or other support traffic in the enemy rear. The capability to attack preferentially the enemy's combat elements, and directly reduce their combat strength, is essential to the effectiveness of FOFA operations with limited resources.

The same reconnaissance, surveillance, and situation assessment suite can serve all of these operational concepts. The suite includes SIGINT sensors, radar imagery and moving target surveillance, and a processing system for fusion and situation assessment.[4]

Both the GUARDRAIL/Common Sensor (GR/CS) system and the Tactical Reconnaissance System (TRS) have integrated SIGINT suites, containing both COMINT and ELINT sensors. The COMINT sensors can intercept radio traffic used to control unit movements and maintain contact with higher headquarters. The ELINT sensors can locate the air defense radars that protect the moving unit. This sensor data is not enough to detect and locate a unit, however. SIGINT, although very sophisticated, can be defeated either by spoofing or by very strict emissions control discipline. For this reason, imagery and MTI radar data is fused with SIGINT data to provide confident detection and accurate location of an enemy unit.

The Joint STARS wide-area surveillance capability (indicated by J(S)TARS in table 12-1) would provide moving target indication over a large area. This data can be combined with the SIGINT data to identify potential target areas. In order to confirm the presence of a unit, the Advanced Synthetic Aperture Radar System (ASARS) can provide high-resolution radar imagery of specific locations. This is an example of a "cue and confirm" approach to RSTA.[5] In general, surveillance systems provide cues and reconnaissance systems provide confirmation.

For example, ELINT and COMINT may provide indications of a division arriving in an assembly area and a rough estimate of its location. When MTI data collected over the previous and subsequent hours are studied, they may show a large number of vehicle "tracks" which lead into the area and disappear because the vehicles slowed or stopped. There may also be characteristic helicopter movements near the headquarters area. Armed with this data, the assessment center can task the ASARS to obtain high-resolution imagery of the suspected assembly area, which can be used to precisely locate vehicle clusters and identify characteristic arrangements of vehicles typical of command posts or other high-value targets.

A fusion capability is vital to this approach for locating follow-on forces. Table 12-1 lists two data fusion systems, the ASAS (Army) and the ENSCE (Air Force), the twin products of the current Joint Tactical Fusion Program. These systems will be very similar, with much commonality between them in equipment and software. They will accept data from the sensors, and support the situation assessment process by providing the capability to fuse or combine the information in appropriate ways for operator evaluation.

This suite of SIGINT, radar, and fusion systems is expected to provide the capability to detect, locate, and track follow-on regiments and divisions. This capability will extend to a depth of 100 to 150 kilometers beyond the FLOT.[6] This flexibility of reconnaissance, surveillance, and situation assessment systems is an example of the flexibility of particular systems for FOFA, and their ability to support different operational concepts.

[4] See James L. Jones and Peter W. Lert, *Follow-On Force Attack, Volume II: Reconnaissance Surveillance, and Target Acquisition (RSTA) Architecture to Support Follow-On Force Attack* (Alexandria, VA: Institute for Defense Analyses, report R-302, for an analysis of such a suite of systems, which illustrates a possible structure for the suite and analyzes its capability to locate and track combat units.

[5] In this example, SIGINT provides initial cues, MTI data provide further cues and tentative confirmation, and SAR imagery provides final confirmation.

[6] See app. 12-A (vol. 2), paragraph 3 for discussion of this range limitation.

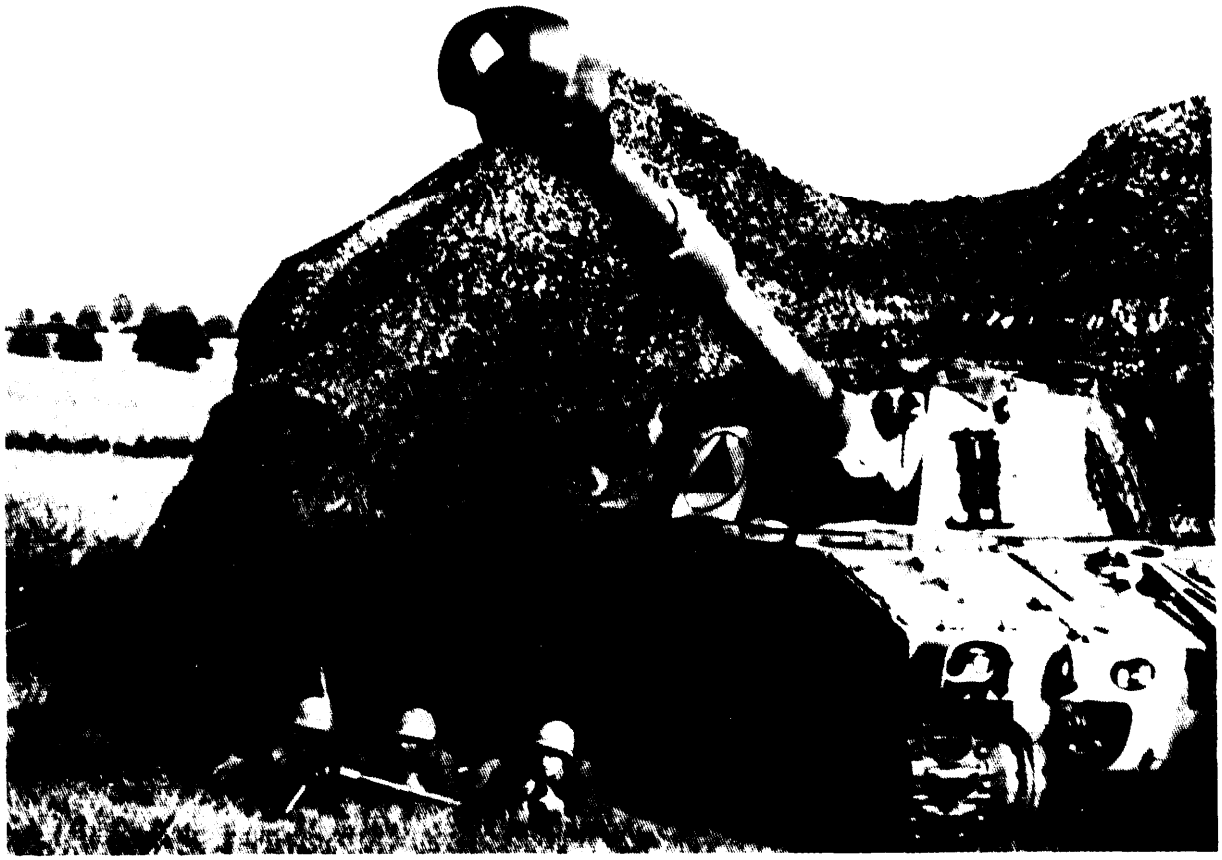

Photo **credit U.S. Department of Defense**

155-millimeter howitzer.

Artillery Attack of Regiment Columns (at 5 to 30 km)

This package uses the high firing rate of artillery to destroy enemy regiments on their final road march toward the battle area. As described in the *OTA Special Report,* the Army approach for deep attack of "decide, detect, and deliver" would be used. In this approach, resources are allocated to the mission and the areas or road segments in which the attack will be focused (engagement zones) are designated ahead of time (decided) by analyzing terrain and possible enemy actions. Surveillance is maintained to detect the regiment move out of its final assembly area and the movement of battalion columns toward and into the engagement zones at which time the artillery de*livers* its planned ordnance.

The R&S/SA suite for locating moving combat units is basic to this package. The TA/AC capabilities for this package include the Aquila RPV system and the Advanced Field Artillery Tactical Data System (AFATDS). The Aquila RPV can loiter in the target area and provide precision imagery for targeting[7] to the corps artillery Fire Support Element, which controls artillery operations through the AFATDS. Both rocket (MLRS) and tube (8-inch) artillery have smart anti-armor rounds in development:[8] the TGW (Terminally Guided Warhead) for MLRS, and SADARM (Search and Destroy Armor Munition) for the 8-inch gun. This package has no special support re-

[7]Aquila imagery can also be used for damage assessment.
[8]See ch. 11 for discussion.

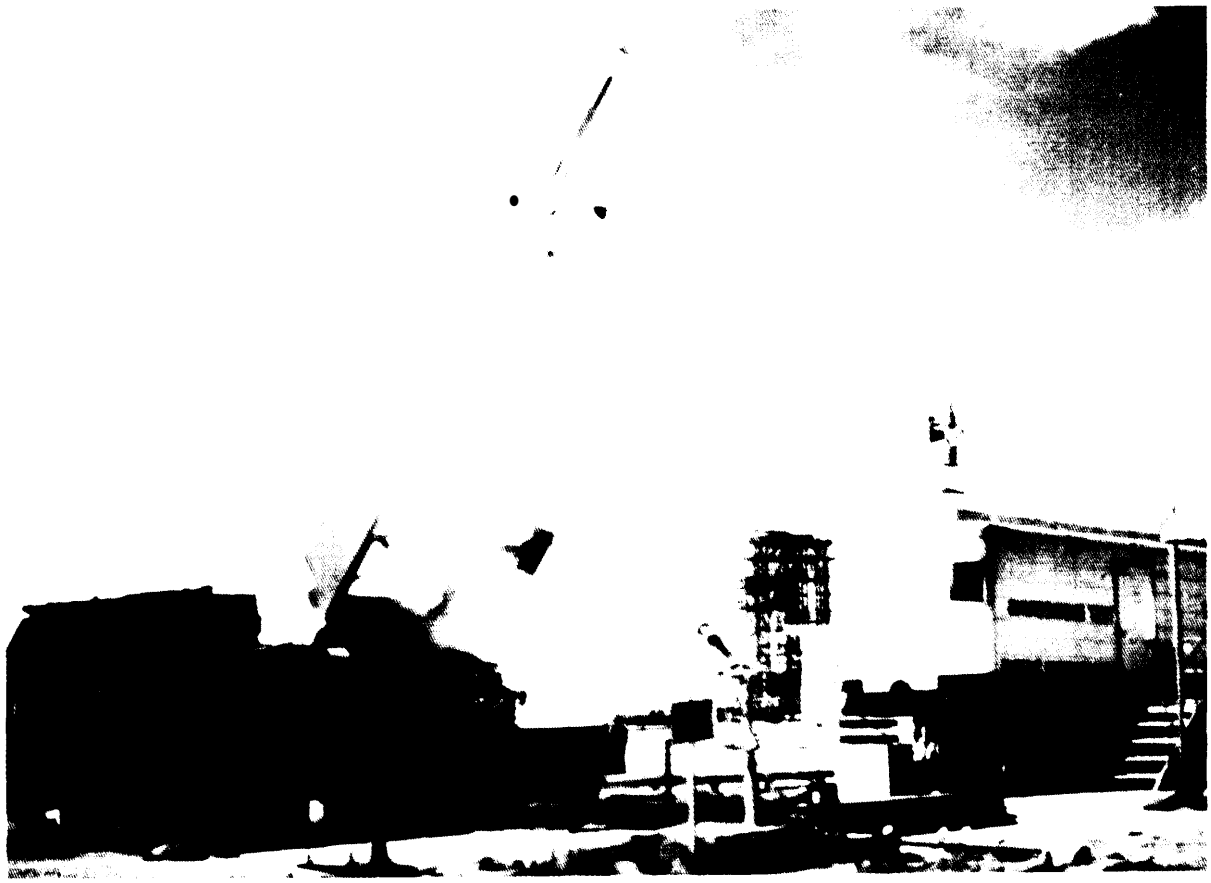

Photo credit *U S Department of Defense*

Multiple-Launch Rocket System (MLRS).

quirements, because it does not involve penetrating enemy airspace.[9]

Standoff Air Attack of Division Columns (at 30 to 80 km)

This package uses TACAIR with stand-off weapons to destroy enemy divisions on the road when they leave their assembly areas. The F-16 platform attacks with a Modular Stand-Off Weapon (MSOW) that flies a distance of 25 to 50 kilometers and then dispenses smart submunitions against targeted columns of vehicles within the division that is moving.

The situation assessment capability to track follow-on divisions, as described above, is essential. With it, NATO forces can attack just the combat divisions and not the total vehicle traffic in the Warsaw Pact rear. The output of the situation assessment process is provided to the air command and control element, which assigns aircraft to attack the division when it makes its move forward. Joint STARS provides target location data by tracking columns of vehicles out of the assembly area and down their routes. The attack F-16s penetrate in a less well-defended area near the target area, and fly to a launch point within range of the target area. Meanwhile, because the targets move while the aircraft are flying, target location updates are provided to the aircraft in flight just prior to weapons release. Joint

[9]The general requirements for C' and logistics support are understood, without being specifically called out, for this and all other operational concepts and packages.

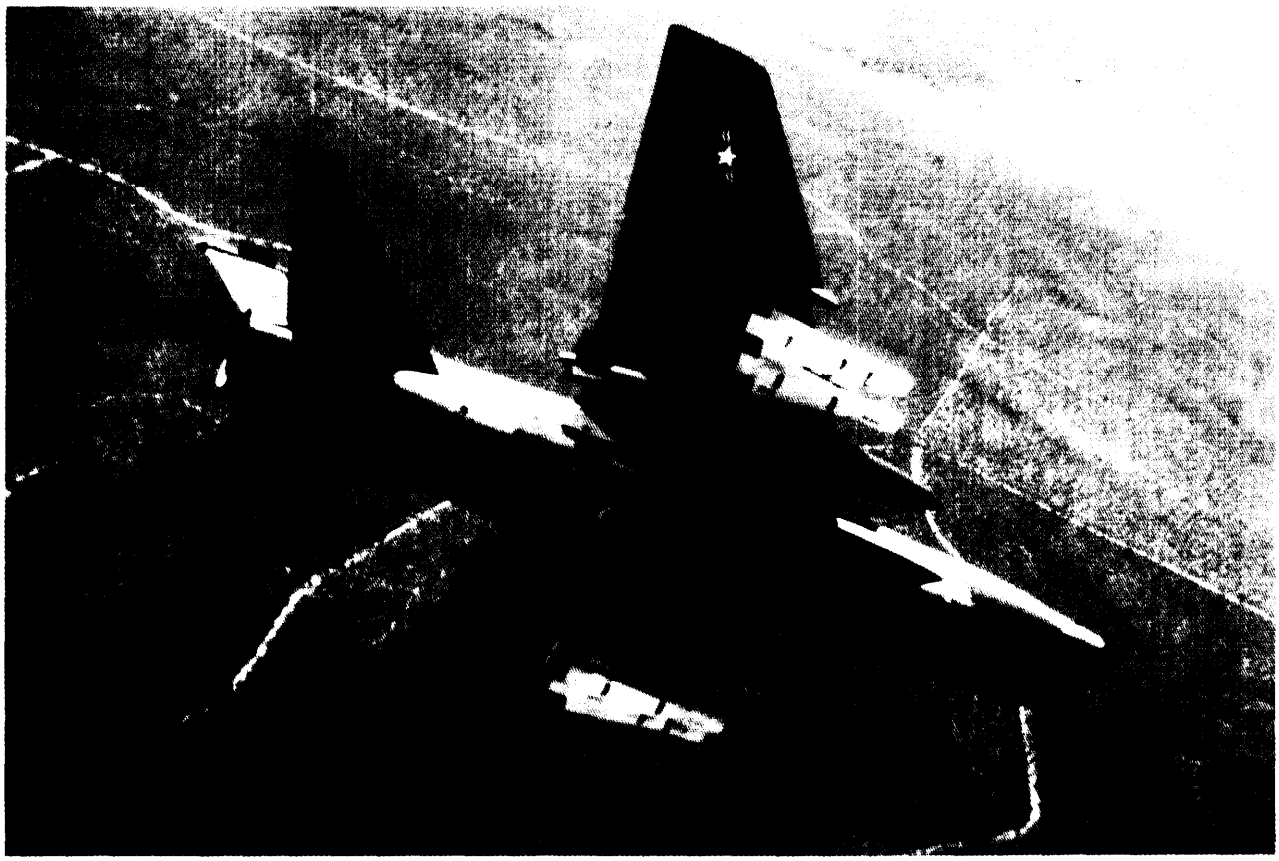

Photo credit: U.S. Department of Defense

The Maverick missiles carried on this A-7 have short stand-off. Each can kill at most one target.

STARS transmits this data to Weapons Interface Units (WIUs) on the attack aircraft via signals encoded in the radar beam, providing highly jam-resistant data links to the F-16s over enemy territory. The target updates are fed into the weapons by the aircraft fire control systems, and the MSOWs are launched from the F-16s.

In order for this package to be effective, the penetrating aircraft need support.[10] This Suppression of Enemy Air Defenses (SE AD) could be provided by PLSS and ATACMS.[11] PLSS would target air defense radars and provide data to the MLRS units that fire ATACMS missiles. Joint STARS and ASARS may also be capable of targeting elements of air defense units (ADUs).

Missile Attack of Division Columns (at 30 to 80 km)

This package uses ground-launched missiles to attack the same targets with the same objective as that of the previous package. The weapon system is the Army Tactical Missile System (ATACMS), which is launched from standard MLRS launchers. This package embodies an operational capability generally similar to the Assault Breaker technology demonstration program of DARPA, and is its closest descendant.

[10] "Penetration support such as escort fighters and electronic warfare aircraft are also needed.

[11] This was the subject of Initiative 15 in the "Memorandum of Agreement on U.S. Army -U.S. Air Force Joint Force Development Process" between the Chiefs of Staff of the Army and Air Force signed May 22, 1984.

Photo credit: LTV Aerospace & Defense Co.

The developmental Army TACMS missile, designed to be launched from the MLRS launcher.

The operational concept again follows the U.S. Army "decide, detect, deliver" approach for deep attack. The situation assessment capability detects, locates, and tracks follow-on divisions, and the corps Fire Support Element (which controls the attack) allocates launchers to this mission and determines engagement zones in which to engage columns of vehicles. Joint STARS supports attack planning and control by tracking vehicle columns departing the assembly area, forecasting times and locations at which they can be engaged, and providing missile-launching batteries with last-minute confirmation that targeted columns are entering planned engagement zones. Joint STARS data is passed to the MLRS launchers via AFATDS, allowing updates of engagement time and place just prior to launch. When the missile arrives at the target, it dispenses either smart anti-armor submunitions (Skeet or TGSM), or cluster munitions with capability against trucks and light armor (Dual Purpose Improved Cluster Munitions--DPICM), or both, also depending on detailed munitions effectiveness. As with the artillery package, no special support is needed by this package.

Air Attack of Chokepoints and Halted Units (at 80 to 150 km)

This package attacks follow-on divisions as they move on roads toward their concentration areas (division assembly areas). The attack is conducted in two phases. First, a chokepoint is created along a division's route by dropping a bridge just before the division column arrives. Second, after a period of time sufficient to let enough of the division arrive at the chokepoint and halt there, the resulting bunches of stationary vehicles are attacked by tactical aircraft using short stand-off weapons.

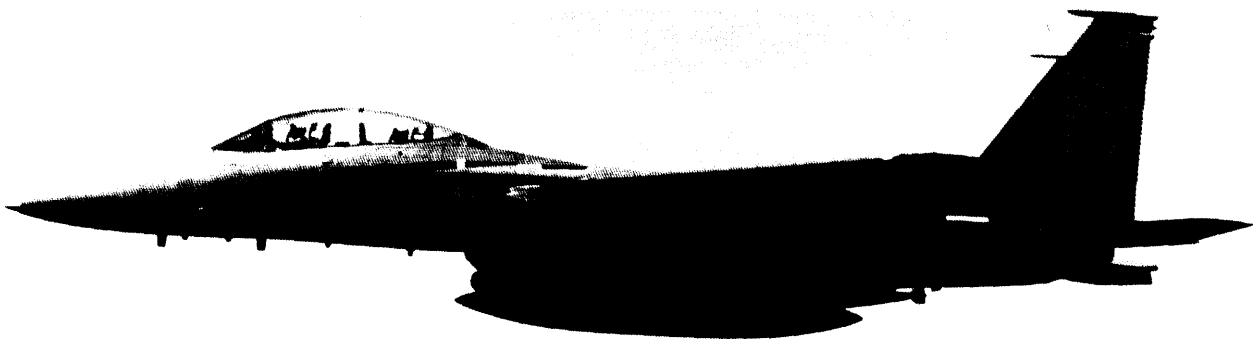

Photo credit' McDonnell Douglas Corp

F-15E carrying a laser-guided bomb.

The situation assessment capability to detect, locate, and track follow-on divisions is again necessary to identify target divisions and likely attack times and places. Once these targets are chosen by the air command and control elements, the two phases of the attack are planned and coordinated. One or two F-15Es attack the target bridge by delivering one or two GBU-15 Glide Bomb Units, which can be guided with sufficient accuracy to drop the bridge." After the bridge is dropped, the area behind it is kept under surveillance by ASARS to observe the arrival and buildup of elements of the division. This information is passed to the Ground Attack Control Center (GACC), which controls the subsequent attack. When the GACC determines that targets are (or will be) there, F-16s in a strike package are given the target locations and scrambled or assembled to make the attack. This package penetrates with its escort and other support, and flies to a point some distance from the halted division in order to launch MSOWs. This avoids facing the division's air defenses, which are likely to be expecting attack (because the bridge attack can be interpreted as tactical warning).

The F-16s launch their weapons, which fly to designated target points and dispense a mix of APAM munitions and mines to both damage and disrupt the halted division. 13 Because the targets are relatively dense vehicle clusters, and the personnel may not be in protective vehicles, APAM munitions are likely to cause more damage to the division's fighting power than anti-armor munitions would; mines will then make more remote the possibility of recovering from the attack.

Cruise Missile Attack of the Deep Rail Network (at 350 to 800 km)

This package provides a capability to attack the rail network across eastern Europe, in order to delay the movement of Soviet divisions through this area. It does not use the same type of situation assessment capability as the other packages. The platform is a long-range bomber, the B-52, based in the CONUS. Over NATO territory, these aircraft launch long-range cruise missiles which conduct the actual attack. A B-52 can carry about 20 such weapons.

[12]The target division has not arrived yet; the air defenses at the bridge, then, are not likely to be heavy.

[13]The targets are not moving; no target location update, then, is necessary.

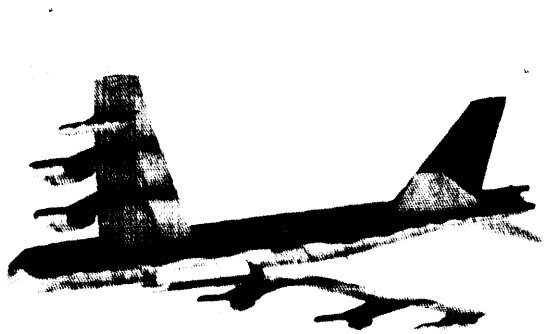

Photo credit U.S. Department of Defense

B-52 bomber launching a cruise missile.

Once launched, these missiles navigate autonomously (using GPS or some other system) to the vicinity of the chosen rail line. Upon encountering the rail at the designated location, the weapon dispenses mines which embed themselves in the rail bed. These mines activate after a preprogrammed delay, and then attack a passing train. This attack will blow a hole in the rail bed and derail the train. Clearing the area and repairing the track will take 18 to 24 hours.

Because the bombers do not penetrate enemy airspace, no special support is needed for this package.

FLEXIBILITY OF SYSTEMS FOR FOFA OPERATIONS

The set of capability packages summarized in table 12-1 is just a small portion of the total set of packages for FOFA listed in appendix 12-A. This longer list is itself not exhaustive; it gives only one package for each operational concept listed.

Appendix 12-B contains a table of the contributions of systems across the full range of operational concepts outlined in appendix 12-A. These systems are grouped into the same four functional areas[14] used in presenting the capability packages:

1. reconnaissance, surveillance, and situation assessment;
2. target acquisition and attack control;
3. platform; and
4. weapon.

Each system is considered for each operational concept, and its capability rated as "full, " "limited," or none for the given function. This illustrates the flexibility of systems for FOFA operations, by showing the ways in which a given system can contribute to a number of capability packages. Further, it indicates how fallback capabilities may exist in particular areas (e.g., targeting moving columns) if specific systems cannot fulfill the needs of a given operational approach. For systems currently in development, these ratings presume that the system is procured and deployed with the capabilities presently specified.

The suite of sensor and fusion systems for reconnaissance, surveillance, and situation assessment for attack of moving combat units offers full capability to implement all concepts for attacks within about 150 kilometers of the FLOT. This suite–which includes GR/CS, TRS, ASARS, Joint STARS, and the JTF systems–gives the operational commander great flexibility to use any concept that fits the tactical situation and can be implemented with available platforms and weapons. Attacks deeper than this will need other assets for situation assessment, and on-board systems for target acquisition.

RPV and UAV systems can provide full or limited support to situation assessment for all of the attack concepts out to about 150 kilometers beyond the FLOT. These systems also

[14] The "support" category is not considered here.

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provide great flexibility, although capability is limited by the lack of wide area coverage.

Joint STARS and ASARS provide full or limited capability for target acquisition for all attack concepts within about 150 kilometers of the FLOT. These systems are also complementary, each providing a fallback capability for the other. A mixed deployment of both systems would provide a commander with great flexibility in conducting attacks with available weapons, and being able to target these weapons effectively. With WIUs, attacking aircraft or missiles could receive target data updates directly from Joint STARS, or indirectly from the systems, via the Weapon Data Link of Joint STARS. This would provide limited or full capability for target data communications for nearly all attack concepts using Joint STARS target acquisition and would provide substantial flexibility for the attack control function.

Tactical aircraft such as the F-16, F-15E, F-111, and Tornado provide great flexibility for attack concepts within their mission ranges, which extend to about 150 kilometers beyond the FLOT for the F-16 and up to 350 kilometers for the other aircraft.

The MLRS platform also provides substantial flexibility to about 150 kilometers, considering its capability to launch either the current artillery rocket or ATACMS rockets.

An air-launched stand-off weapon such as the MSOW and a ground-launched weapon such as ATACMS together provide excellent flexibility as well as a capability to execute nearly any attack concept within about 150 kilometers of the FLOT.

A mix of smart anti-armor munitions (e.g., TGSM or Skeet) and APAM munitions also provides flexibility in attacking effectively the full spectrum of targets in this range. Mines can provide a flexible supplement to other munitions. They can contribute limited capability across nearly the full range of operational concepts, but provide full capability in only one concept.

Weapons such as the MLRS/TGW, GBU-15, and AGM-130B can provide important capabilities, but only in one or a few concepts each. These weapons do not individually provide flexibility to the commander, although they may contribute to his flexibility in combination with other weapons.

Appendix 12-A

Summary of Packages for Attacks of Follow-On Forces

The table below provides a summary of capability packages for attack of follow-on forces. Operational concepts are listed in the first column, and the remaining columns list systems that could perform the various key functions: reconnaissance, surveillance, and situation assessment; target acquisition and attack control; weapons platform; weapon; and necessary support (primarily for penetration of hostile airspace). These operational concepts have all been identified by OTA as being under consideration by the U.S. or Allied military and appear to be technically feasible, but they do not necessarily represent an exhaustive set of operational concepts for FOFA. Similarly, the packages (and systems chosen for the packages) are meant to be illustrative, and do not represent a complete list of systems or packages for FOFA.

Many systems names and acronyms are necessary for this table; they are defined in the Glossary at the end of this volume. Specific notes are given at the end of the table.

OPERATIONAL CONCEPT	RECONNAISSANCE, SURVEILLANCE & SITUATION ASSMNT	TGT ACQ & ATTACK CONTROL	PLATFORM	WEAPON	SUPPORT
DIRECT AIR ATTACK REGIMENTAL COLS[a] 5-30 KM	GR/CS+TRS +ASARS+J(S) TARS[b] +ENSCE	LANTIRN +GACC	F-16	SFW	PLSS +MLRS +F- 4G
STANDOFF AIR ATK[c] REGIMENTAL COLS 5-30 KM	SAME	JS(TA)RS[d] +GACC	F-16	MSOW +SKEET/TGSM[e]	---
MISSILE ATTACK REGIMENTAL COLS 5-30 KM	GR/CS+TRS +ASARS+J(S)TARS +ASAS	JS (TA) RS +AFATDS	MLRS	ATACMS +SKEET/TGSM	---
ARTILLERY ATTACK REGIMENTAL COLS 5-30 KM	SAME	AQUILA +AFATDS	MLRS +8 - INCH	MLRS/TGW +SADARM	---

OPERATIONAL CONCEPT	RECONNAISSANCE, SURVEILLANCE & SITUATION ASSMNT	TGT ACQ & ATTACK CONTROL	PLATFORM	WEAPON	SUPPORT
DIRECT AIR ATTACK DIVISION COLUMNS[a] 30-80 KM	GR/CS+TRS +ASARS+J(S)TARS +ENSCE	LANTIRN +GACC	F-16	SFW	PLSS +ATACMS +F-4G/F-15
STANDOFF AIR ATK DIVISION COLUMNS 30-80 KM	SAME	JS(TA)RS +WIU	F-16	MSOW +SKEET/TGSM +CEB	PLSS +ATACMS
MISSILE ATTACK DIVISION COLUMNS 30-80 KM	GR/CS+TRS +ASARS+J(S)TARS +ASAS	JS(TA)RS +AFATDS	MLRS	ATACMS +SKEET/TGSM +DPICM	---
DIRECT AIR ATTACK REGT ASSY AREAS 30-80 KM	GR/CS+TRS +ASARS+J(S)TARS +ENSCE	ASARS +WIU	F-16	TMD +CEB	PLSS +ATACMS +F-4G/F-15
STANDOFF AIR ATK REGT ASSY AREAS 30-80 KM	SAME	IEW UAV +FTI/E-O[f] +GACC	F-16	MSOW +CEB	PLSS +ATACMS
MISSILE ATTACK REGT ASSY AREAS 30-80 KM	GR/CS+TRS +ASARS+J(S)TARS +ASAS	IEW UAV +FTI/E-O +AFATDS	MLRS	ATACMS +DPICM	---
DIRECT AIR ATK MOVING COLUMNS 80-150 KM	GR/CS+TRS +ASARS+J(S)TARS +ENSCE	LANTIRN	F-16	SFW	PLSS +ATACMS +F-4G/F-15
STANDOFF AIR ATK MOVING COLUMNS 80-150 KM	SAME	JS(TA)RS +WIU	F-16	MSOW +CEB	PLSS +ATACMS
MISSILE ATTACK MOVING COLUMNS 80-150 KM	GR/CS+TRS +ASARS+J(S)TARS +ASAS	JS(TA)RS +WIU	MLRS	ATACMS +DPICM	---
AIR ATTACK DIV ASSY AREAS 80-150 KM	GR/CS+TRS +ASARS+J(S)TARS +ENSCE	ASARS	F-16	MSOW +CEB	PLSS +ATACMS
MISSILE ATTACK DIV ASSY AREAS 80-150 KM	GR/CS+TRS +ASARS+J(S)TARS +ASAS	IEW UAV +FTI/E-O	MLRS	ATACMS +DPICM	---

OPERATIONAL CONCEPT	RECONNAISSANCE, SURVEILLANCE & SITUATION ASSMNT	TGT ACQ & ATTACK CONTROL	PLATFORM	WEAPON	SUPPORT
AIR ATTACK CHOKPT+HLTD UNIT[g] 80-150 KM	GR/CS+TRS +ASARS+J(S)TARS +ENSCE	ASARS +GACC	F-15E +F-16	GBU-15 +MSOW +CEB/MINES	PLSS +ATACMS
JOINT ATTACK CHOKPT+HLTD UNIT 80-150 KM	GR/CS+TRS +ASARS+J(S)TARS +ASAS	IEW UAV +FTI/E-O +AFATDS	F-15E +MLRS	GBU-15 +ATACMS +DPICM	---
AIR ATTACK COMMAND POSTS 80-150 KM	GR/CS+TRS +ASARS+J(S)TARS +ENSCE	ASARS	F-16	MSOW +APAM/CBU	PLSS +ATACMS
MISSILE ATTACK COMMAND POSTS 80-150 KM	GR/CS+TRS +ASARS+J(S)TARS +ASAS	IEW UAV +FTI/E-O	MLRS	ATACMS +M-74	---
AIR ATTACK UNITS ON ROADS 150-350 KM	ACTIVITY CUE	LANTIRN	F-15E F-ill TORNADO	AGM-130B +CEB	PLSS +F-15
CRUISE MISSILE ATK UNITS ON ROADS 150-350 KM		--(ON WPN)	B-52	CALCM-X[h] +AUTO TGT +CEB	---
CRUISE MISSILE ATK RAIL NETWORK 350-800 KM	ACTIVITY CUE	--(ON WPN)	B-52	CALCM-X +GPS/TERCOM +RAIL MINES[i]	---
CRUISE MISSILE ATK RIVER BRIDGES 350-800 KM	PEACETIME INTEL (COORDINATES)	--(ON WPN)	B-52	CALCM-X +GPS/LADAR +WDU-25B	---
CRUISE MISSILE ATK UNITS ON RAILS 350-800 KM	ACTIVITY CUE	--(ON WPN)	B-52	CALCM-X +AUTO TGT +CEB	---

Notes :

a) REGIMENTAL COLUMNS and DIVISION COLUMNS are targets for attack when they are moving on roads after exiting assembly areas.
b) J(S)TARS denotes the MTI surveillance capability of Joint STARS.
c) STANDOFF AIR ATK denotes air attack from standoff of 25-50 km, using a weapon such as the MSOW (Modular Standoff Weapon) now under study in NATO. This weapon would employ a dispenser and either anti-armor or APAM submunitions.
d) JS(TA)RS denotes the target acquisition and attack control capabilities of Joint STARS.
e) SKEET/TGSM denotes the use of either sensor-fuzed weapon or terminally-guided submunition technology, or both, for anti-armor munitions.
f) FTI/E-O for the IEW UAV denotes a target acquisition package on the IEW UAV using either radar or electro-optical sensors, or both.
g) CHOKPT+HLTD UNIT is a target in the concept where a chokepoint is created by attack (e.g. dropping a bridge) just prior *to* the arrival of an enemy unit, which, when halted behind the chokepoint, is then itself attacked.
h) CALCM-X denotes a conventionally-armed air launched cruise missile, possibly ALCM-B retired from SIOP duty and modified to have less range with more payload. For attack of units on trains, this weapon would have automatic target recognition (AUTO TGT) ; for bridge attack a laser radar (LADAR) and the BULLPUP warhead (WDU-25B) would be used.
i) RAIL MINE denotes a mine to damage track and derail moving trains, possibly based on a modified anti-bunker munition and a Mk-75 fuze.

SOURCE: Office of Technology Assessment, 1987.

Appendix 12-B

Flexibility and Application of Systems for Attacks of Follow-On Forces

The following table indicates the application of systems to the functions of FOFA operations outlined in chapters 6 and 12. The range of applicability illustrates the flexibility of these systems, in being able to support several different operational concepts for attacks of follow-on forces.

Many system names and acronyms are necessary for this table—they are defined in the Glossary at the end of this volume.

LEGEND :

FULL	Full operational capability (expected) for specified function .
Limited	Limited or partial operational capability (expected) for specified function .
--	No operational capability (expected) , or not applicable , for specified function.

SOURCE : Office of Technology Assessment, 1987, [based on information supplied by sources cited in the full document].

5-30 KM ATTACKS

OPERATIONAL CONCEPTS

1 DIRECT AIR ATTACKS OF REGIMENT COLUMNS*
2 STANDOFF AIR ATTACKS OF REGIMENT COLUMNS*
3 MISSILE ATTACKS OF REGIMENT COLUMNS*
4 ARTILLERY ATTACK OF REGIMENT COLUMNS*

RS/SA SYSTEM	OPERATIONAL CONCEPTS 1	2	3	4
GR/CS	FULL	FULL	FULL	FULL
TRS	FULL	FULL	FULL	FULL
ASARS	FULL	FULL	FULL	FULL
J(S)TARS	FULL	FULL	FULL	FULL
ENSCE	FULL	FULL	--	--
ASAS	--	--	FULL	FULL
AQUILA	-Limited	Limited	Limited	Limited
IEW UAV/FTI-EO	Limited	Limited	Limited	Limited
ACTIVITY CUE	--	--	--	--
PEACETIME INTEL	--	--	--	--
TA/AC SYSTEM				
LANTIRN	FULL	--	--	--
JS(TA)RS	Limited	FULL	FULL	Limited
AQUILA	Limited	Limited	FULL	FULL
IEW UAV/FTI-EO	--	--	--	--
ASARS	Limited	Limited	Limited	Limited
WIU	Limited	FULL	FULL	--
GACC	FULL	FULL	--	--
AFATDS	--	--	FULL	FULL
PLATFORM				
MLRS	--	--	FULL	FULL
8-INCH	--	--	--	FULL
F-16	FULL	FULL	--	--
F-15E	FULL	FULL	--	--
F-111	FULL	FULL	--	--
TORNADO	FULL	Limited	--	--
B-52	--	--	--	--
WEAPON				
SFW	FULL	--	--	--
MSOW	Limited	FULL	--	--
ATACMS	--	--	FULL	--
MLRS/TGW	--	--	--	FULL
GBU-15	Limited	--	--	--
AGM-130B	--	Limited	--	--
CALCM-X	--	--	--	--
TGSM/SKEET/SADARM	FULL	FULL	FULL	FULL
CEB/DPICM	--	Limited	Limited	Limited
MINES	--	Limited	Limited	Limited

*Regiment is attacked when it is moving forward after exiting final assembly area. Individual targets are battalion-sized columns within the regiment.

30-80 KM ATTACKS — OPERATIONAL CONCEPTS

5 DIRECT AIR ATTACKS OF DIVISION COLUMNS*
6 STANDOFF AIR ATTACKS OF DIVISION COLUMNS*
7 MISSILE ATTACKS OF DIVISION COLUMNS*
8 DIRECT AIR ATTACKS OF REGIMENT ASSEMBLY AREAS
9 STANDOFF AIR ATTACKS OF REGIMENT ASSEMBLY AREAS
10 MISSILE ATTACKS OF REGIMENT ASSEMBLY AREAS

*Division is attacked when it is moving forward after exiting assembly area, Individual targets are battalion-sized columns within the division.

	OPERATIONAL CONCEPTS					
RS/SA SYSTEM	5	6	7	8	9	10
GR/CS	FULL	FULL	FULL	FULL	FULL	FULL
TRS	FULL	FULL	FULL	FULL	FULL	FULL
ASARS	FULL	FULL	FULL	FULL	FULL	FULL
J(S)TARS	FULL	FULL	FULL	FULL	FULL	FULL
ENSCE	FULL	FULL	--	FULL	FULL	--
ASAS	--	--	FULL	--		FULL
AQUILA	--	--	--	--	--	
IEW UAV/FTI-EO	Limited	Limited	Limited	Limited	Limited	Limited
ACTIVITY CUE	--	--	--	--	--	
PEACETIME INTEL	--	--	--	--	--	
TA\AC SYSTEM						
LANTIRN	FULL	--	--	FULL		
JS(TA)RS	Limited	FULL	FULL	Limited	Limited	Limited
AQUILA	--	--	--	--	--	--
IEW UAV/FTI-EO	--	--	--	Limited	FULL	FULL
ASARS	Limited	Limited	Limited	FULL	FULL	FULL
WIU	Limited	FULL	FULL	FULL	FULL	FULL
GACC	FULL	Limited	--	FULL	FULL	--
AFATDS	--	--	FULL	--	--	FULL
PLATFORM						
MLRS	--	--	FULL	--	--	FULL
8-INCH	--	--	--	--	--	--
F-16	FULL	FULL	--	FULL	FULL	
F-15E	FULL	FULL	--	FULL	FULL	
F-111	FULL	FULL	--	FULL	FULL	--
TORNADO	FULL	Limited	--	FULL	Limited	
B-52	--	--	--	--	--	--
WEAPON						
SFW	FULL	--	--	FULL	--	
MSOW	Limited	FULL	--	Limited	FULL	
ATACMS	--	--	FULL	--	--	FULL
MLRS/TGW	--	--	--	--	--	
GBU-15	Limited	--	--	Limited	--	
AGM-130B	--	Limited	--	--	Limited	--
CALCM-X	--	--	--	--		
TGSM/SKEET/SADARM	FULL	FULL	FULL	--	--	--
CEB/DPICM	Limited	FULL	FULL	Limited	FULL	FULL
MINES	Limited	Limited	Limited	Limited	Limited	Limited

80-150 KM ATTACKS — OPERATIONAL CONCEPTS

11 DIRECT AIR ATTACKS OF DIVISION COLUMNS*
12 STANDOFF AIR ATTACKS OF DIVISION COLUMNS*
13 MISSILE ATTACKS OF DIVISION COLUMNS*
14 AIR ATTACKS OF DIVISION ASSEMBLY AREAS
15 MISSILE ATTACKS OF DIVISION ASSEMBLY AREAS

*Division is attacked when it is moving towards its assembly area. Individual targets are battalion-sized columns within the division.

	OPERATIONAL CONCEPTS				
RS/SA SYSTEM	11	12	13	14	15
GR/CS	FULL	FULL	FULL	FULL	FULL
TRS	FULL	FULL	FULL	FULL	FULL
ASARS	FULL	FULL	FULL	FULL	FULL
J(S)TARS	FULL	FULL	FULL	FULL	FULL
ENSCE	FULL	FULL	--	FULL	--
ASAS	--	--	FULL	--	FULL
AQUILA	--	--	--	--	--
IEW UAV/FTI-EO	Limited	Limited	Limited	Limited	Limited
ACTIVITY CUE	--	--	--	--	--
PEACETIME INTEL	--	--	--	--	--
TA/AC SYSTEM					
LANTIRN	FULL	--	--	--	--
JS(TA)RS	Limited	FULL	FULL	Limited	Limited
AQUILA	--	--	--	--	--
IEW UAV/FTI-EO	--	Limited	Limited	FULL	FULL
ASARS	Limited	Limited	Limited	FULL	FULL
WIU	Limited	FULL	FULL	FULL	FULL
GACC	FULL	Limited	--	FULL	--
AFATDS	--	--	FULL	--	FULL
PLATFORM					
MLRS	--	--	FULL	--	FULL
8-INCH	--	--	--	--	--
F-16	FULL	FULL	--	FULL	--
F-15E	FULL	FULL	--	FULL	--
F-Ill	FULL	FULL	--	FULL	--
TORNADO	FULL	Limited	--	Limited	--
B-52	--	--	--	--	--
WEAPON					
SFW	FULL	--	--	--	--
MSOW	Limited	FULL	--	FULL	--
ATACMS	--	--	FULL	--	FULL
MLRS/TGW	--	--	--	--	--
GBU-15	Limited	--	--	--	--
AGM-130B	--	Limited	--	Limited	--
CALCM-X	--	--	--	--	--
TGSM/SKEET/SADARM	Limited	Limited	Limited	--	--
CEB/DPICM	Limited	FULL	FULL	FULL	FULL
MINES	Limited	Limited	Limited	Limited	Limited

80-150 KM ATTACKS (CONTINUED)

OPERATIONAL CONCEPTS

16 AIR ATTACK OF CHOKEPOINTS AND HALTED UNITS*
17 JOINT ATTACK OF CHOKEPOINTS AND HALTED UNITS*
18 AIR ATTACK OF COMMAND POSTS
19 MISSILE ATTACK OF COMMAND POSTS

*A chokepoint is created by attack (e.g. dropping a bridge) just prior to the arrival of an enemy unit. Resulting bunches of halted vehicles are attacked.

	OPERATIONAL CONCEPTS			
RS/SA SYSTEM	16	17	18	19
GR/CS	FULL	FULL	FULL	FULL
TRS	FULL	FULL	FULL	FULL
ASARS	FULL	FULL	FULL	FULL
J(S)TARS	FULL	FULL	FULL	FULL
ENSCE	FULL	--	FULL	--
ASAS	--	FULL	--	FULL
AQUILA	--	--	--	--
IEW UAV/FTI-EO	Limited	Limited	Limited	Limited
ACTIVITY CUE	Limited	Limited	--	--
PEACETIME INTEL	--	--	--	--
TA/AC SYSTEM				
LANTIRN	--	--	--	--
JS(TA)RS	Full	Limited	Limited	Limited
AQUILA	--	--	--	--
IEW UAV/FTI-EO	FULL	FULL	FULL	FULL
ASARS	FULL	FULL	FULL	FULL
WIU	FULL	FULL	FULL	FULL
GACC	Limited	--	FULL	--
AFATDS	--	FULL	--	FULL
PLATFORM				
MLRS	--	FULL	--	FULL
8-INCH	--	--	--	--
F-16	FULL	--	FULL	--
F-15E	FULL	FULL	FULL	--
F-ill	FULL	FULL	FULL	--
TORNADO	Limited	Limited	Limited	--
B-52	--	--	--	--
WEAPON				
SFW	FULL	--	FULL	--
MSOW	FULL	--	FULL	--
ATACMS	--	FULL	--	FULL
MLRS/TGW	--	--	--	--
GBU-15	FULL	FULL	-Limited	--
AGM-130B	Limited	--	Limited	--
CALCM-X	--	--	--	--
TGSM/SKEET/SADARM	-Limited	Limited	--	--
CEB/DPICM	FULL	FULL	FULL	FULL
MINES	Limited	Limited	Limited	Limited

150-350 KM ATTACKS OPERATIONAL CONCEPTS

20 AIR ATTACKS OF UNITS ON ROADS
21 CRUISE MISSILE ATTACKS OF UNITS ON ROADS

350-800 KM ATTACKS OPERATIONAL CONCEPTS

22 CRUISE MISSILE ATTACKS OF RAIL NETWORK
23 CRUISE MISSILE ATTACKS OF RIVER BRIDGES
24 CRUISE MISSILE ATTACKS OF UNITS ON RAILS

	OPERATIONAL CONCEPTS				
RS/SA SYSTEM	20	21	22	23	24
GR/CS	--	--	--	--	--
TRS	--	--	--	--	--
ASARS	--	--	--	--	--
J(S)TARS	--	--	--	--	--
ENSCE	--	--	--	--	--
ASAS	--	--	--	--	--
AQUILA	--	--	--	--	--
IEW UAV/FTI-EO	--	--	--	--	--
ACTIVITY CUE	FULL	FULL	--	--	FULL
PEACETIME INTEL	--	--	FULL	FULL	--
TA/AC SYSTEM					
LANTIRN	FULL	--			--
JS(TA)RS	--	--			--
AQUILA	--	--			--
IEW UAV/FTI-EO	--	--			--
ASARS	--	--			--
WIU	--	--			--
GACC	--	--			--
AFATDS	--	--			--
PLATFORM					
MLRS	--	--	--	--	--
8-INCH	--	--	--	--	--
F-16	--	--	--	--	--
F-15E	FULL	--	--	--	--
F-ill	FULL	--	--	--	--
TORNADO	FULL	--	--	--	--
B-52	Limited	FULL	FULL	FULL	FULL
WEAPON					
SFW	--	--	--	--	--
MSOW	--	--	--	--	--
ATACMS	--	--	--	--	--
MLRS/TGW	--	--	--	--	--
GBU-15	--	--	--	--	--
AGM-130B	FULL	--	--	--	--
CALCM-X	--	FULL	FULL	FULL	FULL
TGSM/SKEET/SADARM	--	--	--	--	--
CEB/DPICM	FULL	FULL	--	--	FULL
MINES	Limited	--	FULL	--	--