

**PROGRAM OVERVIEW AND UPDATE
FOR
THE JOINT U.S./ROK
RESEARCH, DEVELOPMENT, AND TESTING PROGRAM
FOR NEW UNDERGROUND AMMUNITION
STORAGE TECHNOLOGIES**

PRESENTED BY:

MR. GARY W. ABRISZ
U.S. PROGRAM MANAGER

NARRATIVE VIEWGRAPH 1

GOOD AFTERNOON. I AM GARY W. ABRISZ, THE ASSOCIATE DIRECTOR OF THE U.S. ARMY TECHNICAL CENTER FOR EXPLOSIVES SAFETY IN SAVANNA, ILLINOIS. I AM ALSO THE U.S. PROGRAM MANAGER FOR THE JOINT U.S./REPUBLIC OF KOREA RESEARCH, DEVELOPMENT, AND TEST PROGRAM TO DEVELOP NEW UNDERGROUND AMMUNITION STORAGE TECHNOLOGIES.

MY PURPOSE IS TO PRESENT TO YOU TODAY A VERY BRIEF OVERVIEW AND UPDATE OF THE PROGRAM AND THE ONGOING AND PLANNED ACTIVITIES. SHOULD YOU HAVE SPECIFIC QUESTIONS ON THE TEST PLANNING, WE WILL PRESENT THEM TO MR. KIM DAVIS, THE U.S. TECHNICAL PROGRAM MANAGER. HE WILL BE GLAD TO ANSWER THOSE.

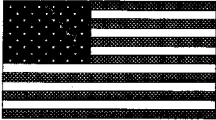
DR. SONG FROM THE REPUBLIC OF KOREA AGENCY FOR DEFENSE DEVELOPMENT, IS ATTENDING THIS SEMINAR AND I WILL BE GLAD TO REFER QUESTIONS YOU MAY HAVE RELATIVE TO THEIR ACTIVITIES TO THEM.

YOU WILL SEE SEVERAL PRESENTATIONS RELATING TO THE MANY SUCCESSES THEY HAVE ENJOYED TO DATE.

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VIEWGRAPH 1

PROGRAM OVERVIEW AND UPDATE



FOR



THE JOINT U.S./ROK

**RESEARCH, DEVELOPMENT, AND TESTING PROGRAM
FOR NEW UNDERGROUND AMMUNITION
STORAGE TECHNOLOGIES**

**PRESENTED TO:
THE 26TH DDESB EXPLOSIVES SAFETY SEMINAR**

**MIAMI, FLORIDA
17 AUGUST 1994**

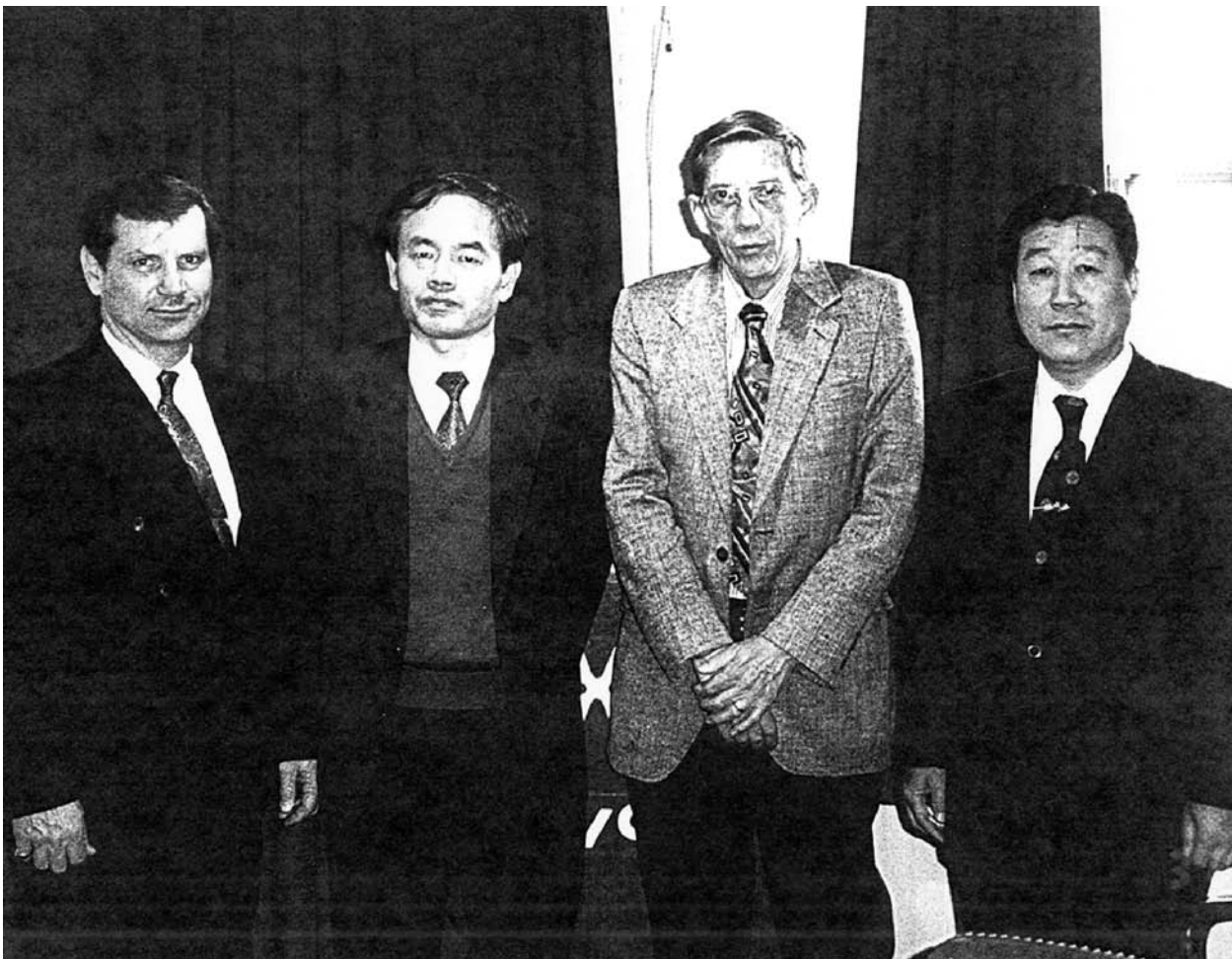
**PRESENTED BY:
MR. GARY W. ABRISZ
U.S. PROGRAM MANAGER**

NARRATIVE VIEWGRAPH 2

THE PROGRAM MANAGERS AND TECHNICAL PROGRAM MANAGERS ARE SHOWN ON THIS CHART.

MY KOREAN COUNTERPART IS REPUBLIC OF KOREA ARMY COLONEL KIM, MYUNG KI, FAR RIGHT IN THIS PHOTO. NEXT TO HIM IS MR. L. KIM DAVIS, U.S. ARMY ENGINEER WATERWAYS EXPERIMENT STATION, WHO IS THE U.S. PROGRAM'S TECHNICAL MANAGER. HIS KOREAN COUNTERPART, NEXT RIGHT, 15 DR. SONG, SO-YOUNG THE AGENCY FOR DEFENSE DEVELOPMENT IN TAEJON, KOREA.

VIEWGRAPH 2



NARRATIVE VIEWGRAPH 3

THIS IS THE OUTLINE OF MY PRESENTATION.

VIEWGRAPH 3

PRESENTATION OUTLINE

- **INTRODUCTIONS**
- **GOAL/OBJECTIVE**
- **ISSUE**
- **RD&T APPROACH**
- **PAST AND CURRENT ACTIVITIES**
- **FUTURE ACTIVITIES**
- **SUMMARY**

NARRATIVE VIEWGRAPH 4

THE PROGRAM GOAL AND MAIN OBJECTIVE REMAIN AS STATED HERE. THE PROGRAM WAS ESTABLISHED TO END WITH APPROVED NEW UNDERGROUND AMMUNITION STORAGE DESIGN CONCEPTS FOR APPLICATION WITHIN THE REPUBLIC OF KOREA.

WE HAVE SUCCESSFULLY CONDUCTED A WIDE SERIES OF SMALL-SCALE AND INTERMEDIATE-SCALE EXPLOSIVES TESTS BOTH WITHIN THE U.S. AND ROK.

YOU WILL SEE PRESENTATIONS AT THIS SEMINAR AND IN THIS PANEL ON MANY OF THE SUCCESSES WE HAVE REALIZED.

OUR NEW CONCEPTS FOR UNDERGROUND MAGAZINES HAVE BEEN EVALUATED, TO PROVIDE NEW STORAGE CAPABILITIES AND TO DRAMATICALLY REDUCE THE PRESENT HAZARD ZONES. THERE HAVE BEEN ADDED UNDERSTANDINGS OF OUR ABILITY TO MATHEMATICALLY SIMULATE THE COMPLEXITIES OF MAGAZINE EXPLOSIONS USING COMPUTER MODELS. OUR SMALL-SCALE AND INTERMEDIATE-SCALE EXPLOSIVES TESTS HAVE PROVIDED AN INVALUABLE SOURCE OF DATA AND INSIGHTS IN THE USE OF COMPUTER CODES APPLICATIONS.

VIEWGRAPH 4

GOAL

- **IDENTIFY, TEST, EVALUATE, AND DEMONSTRATE NEW UNDERGROUND AMMUNITION STORAGE DESIGN CONCEPTS**

OBJECTIVE

- **DESIGN TO REDUCE OR CONTROL EXTERNAL BLAST AND DEBRIS EFFECTS FROM AN ACCIDENTAL EXPLOSION UNDERGROUND**

NARRATIVE VIEWGRAPH 5

THE ISSUE THE DEPARTMENT OF DEFENSE FACES IN KOREA GENERATED THIS OFFICE OF THE SECRETARY OF DEFENSE-DIRECTED AND ARMY MANAGED PROGRAM. THE STORAGE OF U.S. DEPARTMENT OF DEFENSE AMMUNITION IN KOREA RELATES TO APPLICATION OF U.S. EXPLOSIVES SAFETY STANDARDS.

CURRENTLY THE STANDARDS CAN NOT BE ACCOMMODATED TO THE FULL EXTENT AND MANY VIOLATIONS AND EXPOSURES RESULT.

THIS RESEARCH AND DEVELOPMENT EFFORT AS STATED IS DETERMINING THE USE OF NEW TECHNICAL APPLICATIONS AND IS SHOWING REDUCTIONS IN QUANTITY DISTANCE REQUIREMENTS ARE POSSIBLE.

THE 1991 MEMORANDUM OF AGREEMENT AND THE ASSOCIATED STATEMENT OF WORK ARE DIRECTED TOWARD THIS ISSUE. THE RESULTING DESIGN CONCEPTS WILL ELIMINATE THE EXISTING SERIOUS EXPLOSIVES SAFETY VIOLATIONS IN THE REPUBLIC OF KOREA AS WELL AS PROVIDE AN APPLICATION THROUGHOUT THE DEPARTMENT OF DEFENSE STORAGE COMPLEX.

VIEWGRAPH 5

EXPLOSIVES SAFETY ISSUE

- **SERIOUS QUANTITY DISTANCE (QD) VIOLATIONS EXIST IN ROK**
- **U.S./ROK AGREEMENTS REQUIRE APPLICATION OF THE U.S. DOD AMMUNITION AND EXPLOSIVES SAFETY STANDARDS**
- **ESTABLISH THE REALISTIC USE OF U.S./ROK TECHNICAL CAPABILITIES TO REDUCE QD REQUIREMENTS IN THE ROK AND THE U.S.**

NARRATIVE VIEWGRAPH 6

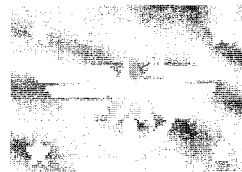
THIS EFFORT WAS DRIVEN BY THE 1989 20TH SECURITY CONSULTATIVE MEETING AT OUR SECRETARY OF DEFENSE LEVEL AND THE REPUBLIC OF KOREA MINISTRY OF NATIONAL DEFENSE LEVEL. WE ENJOY A HIGH VISIBILITY AND EQUAL SUPPORT.

THE CRITERIA CONSIDERATIONS AND CONCEPT DESIGNS DEVELOPED BY THE PROGRAM WILL BE REVIEWED AND APPROVED BY THE U.S. DEPARTMENT OF DEFENSE EXPLOSIVES SAFETY BOARD AND THE REPUBLIC OF KOREA MINISTRY OF NATIONAL DEFENSE EXPLOSIVES SAFETY MANAGEMENT BRANCH AS THE REGULATORY AGENCIES SHOWN HERE. BOTH ORGANIZATIONS ARE DIRECTLY INVOLVED IN THE RESEARCH AND DEVELOPMENT AND TEST PROCESSES AND EVALUATIONS AS WE PROCEED.

VIEWGRAPH 6



RESPONSIBLE ORGANIZATIONS



PROPONENT:

U.S.

CG, COMBINED FORCES
COMMAND AND U.S.
FORCES, KOREA (USFK)

ROK

MINISTRY OF NATIONAL
DEFENSE (MND)

DIRECTING OFFICE:

OFFICE OF THE UNDER
SECRETARY OF DEFENSE
(ACQUISITION)

MND
DIRECTOR, LOGISTICS
BUREAU

REGULATORY AGENCY:

DEPARTMENT OF DEFENSE
EXPLOSIVES SAFETY BOARD

MND
EXPLOSIVES SAFETY
MANAGEMENT BRANCH

PROGRAM MGMT:

U.S. ARMY TECHNICAL
CENTER FOR EXPLOSIVES
SAFETY

MND
EXPLOSIVES SAFETY
MANAGEMENT BRANCH

R&D LEAD LAB:

U.S. ARMY ENGINEER
WATERWAYS EXPERIMENT
STATION

AGENCY FOR DEFENSE
DEVELOPMENT (ADD)

NARRATIVE VIEWGRAPH 7

BOTH THE U.S. AND REPUBLIC OF KOREA HAVE ESTABLISHED TECHNICAL ADVISORY GROUPS. WE AGREED TO DO THIS IN OUR MEMORANDUM OF AGREEMENT NEGOTIATIONS. THIS CHART SHOWS OUR TECHNICAL ADVISORY GROUP PURPOSE AND MEMBERSHIP. A CHARTER HAS BEEN DEVELOPED AND INCORPORATED INTO THE PROGRAM DOCUMENTS.

WE HAVE HAD SEVERAL JOINT MEETINGS. YOU SEE MANY FAMILIAR NAMES ON THIS U.S. CHART.

THIS MEMBERSHIP REPRESENTS MUCH OF THE EXPLOSION EFFECTS EXPERTISE WITHIN THE U.S. DEPARTMENT OF DEFENSE. THE U.S. ARMY MATERIEL COMMAND DEPUTY CHIEF OF STAFF FOR AMMUNITION AND U.S. FORCES, KOREA, J4, REPRESENT THE LOGISTICS INPUT AND THE USER REQUIREMENT CONSIDERATIONS IN THIS CONCEPT DEVELOPMENT. AS A MEMBER OF THE DEPARTMENT OF DEFENSE EXPLOSIVES SAFETY BOARD SECRETARIAT, DR. CANADA PROVIDES THE CHAIRMANSHIP IN SUPPORT OF THE PROGRAM AND TECHNICAL MANAGERS.

THE REPUBLIC OF KOREA HAS AN IMPRESSIVE GROUP OF EXPERTS TO REVIEW THEIR ACTIVITIES AND COORDINATE WITH THIS U.S. GROUP OF EXPERTS. WE HAVE BEEN VERY MUCH IMPRESSED BY THEIR ACTIVITIES AND RESULTS. OUR JOINT PROGRESS HAS BEEN EXCELLENT.

VIEWGRAPH 7

U.S. TECHNICAL ADVISORY GROUP (TAG)

PURPOSE: ADVISE THE PROGRAM MANAGERS (PMs) AND TECHNICAL MANAGERS ON THE NEW UNDERGROUND AMMUNITION STORAGE TECHNOLOGIES (UAST) PROGRAM ACTIVITIES AND CONCEPTS

<u>ORGANIZATION</u>	<u>NAME</u>
<u>DDESB SECRETARIAT</u>	DR. CHESTER E. CANADA
<u>U.S. AIR FORCE</u>	
HQ, SAFETY OFFICE	MR. PAUL D. PRICE, P.E.
<u>U.S. ARMY</u>	
CEHND	MR. PAUL LAHOUD
ARL	MR. JOHN STARKENBERG
AMC DCS AMMO	MR. ROBERT J. FAHY
<u>U.S. NAVY</u>	
NSWC	MR. MICHAEL M. SWISDAK
NFESC	MR. JAMES E. TANCRETO
<u>KOREA</u>	
USFK, J4	MR. LOU BORNSTEIN

NARRATIVE VIEWGRAPH 8

THIS CHART SIMPLY SHOWS THAT THE PROGRAM HAS BEEN PLANNED OUT OVER A FIVE PHASE PERIOD. THE STATEMENT OF WORK DEVELOPED BY USAEWES AND ADD REFLECTS THIS. THE ORGANIZATION OF THE PROGRAM RELATES TO THE INITIAL PLANNING AND PREPARATION THROUGH A YET TO BE DEFINED LARGER VALIDATION TEST. WE ARE IN THE FINAL APPLICATION OF PHASE 3 AND EXPECT THE FINAL REPORT ON THIS PHASE THIS CALENDAR YEAR. THE RESULT, OF COURSE, IS TO BE FINAL CONCEPT DESIGNS WITH ASSOCIATED CRITERIA THAT CAN BE APPROVED BY BOTH THE REPUBLIC OF KOREA EXPLOSIVES SAFETY MANAGEMENT BOARD AND THE U.S. DEPARTMENT OF DEFENSE EXPLOSIVES SAFETY BOARD.

VIEWGRAPH 8

PLAN

- **FIVE PHASES OF WORK**
 - **START IN AUG 91 - COMPLETE IN DEC 96 –**
 - **PHASE 1: R&D PLANNING AND PREPARATION**
 - **PHASE 2: SMALL-SCALE TEST PROGRAM**
 - **PHASE 3: INTERMEDIATE-SCALE INVESTIGATIONS**
 - **PHASE 4: VALIDATION TESTS**
 - **PHASE 5: FINAL CONCEPT DESIGNS**

NARRATIVE VIEWGRAPH 9

THIS AND THE NEXT CHART WILL GIVE YOU AN OVERVIEW OF THE PHASE 2 AND PHASE 3 TESTING.

A SERIES OF SMALL-SCALE MODEL TESTS WERE CONDUCTED BY WATERWAYS EXPERIMENT STATION AND THE AGENCY FOR DEFENSE DEVELOPMENT IN THE REPUBLIC OF KOREA.

USAEWES USING A STEEL CHAMBER AND VARIOUS PIPE CONFIGURATIONS AT 1/20-SCALE CONDUCTED SOME 200 SHOTS AT THE BIG BLACK RIVER TEST SITE OUTSIDE VICKSBURG, MS.

THE ROK ADD CONSTRUCTED STEEL AND CONCRETE MODELS AT THEIR TEST SITE OUTSIDE TAEJON AND CONDUCTED AROUND 50 TESTS THERE.

THE DATA HAS BEEN EVALUATED AND DEVELOPED INTO A PHASE 2 REPORT. RESULTS SHOWED POTENTIAL REDUCTIONS AND WERE JOINTLY APPLIED TO THE INTERMEDIATE-SCALE TEST PLANNING FOR PHASE 3 DESIGN FEATURES.

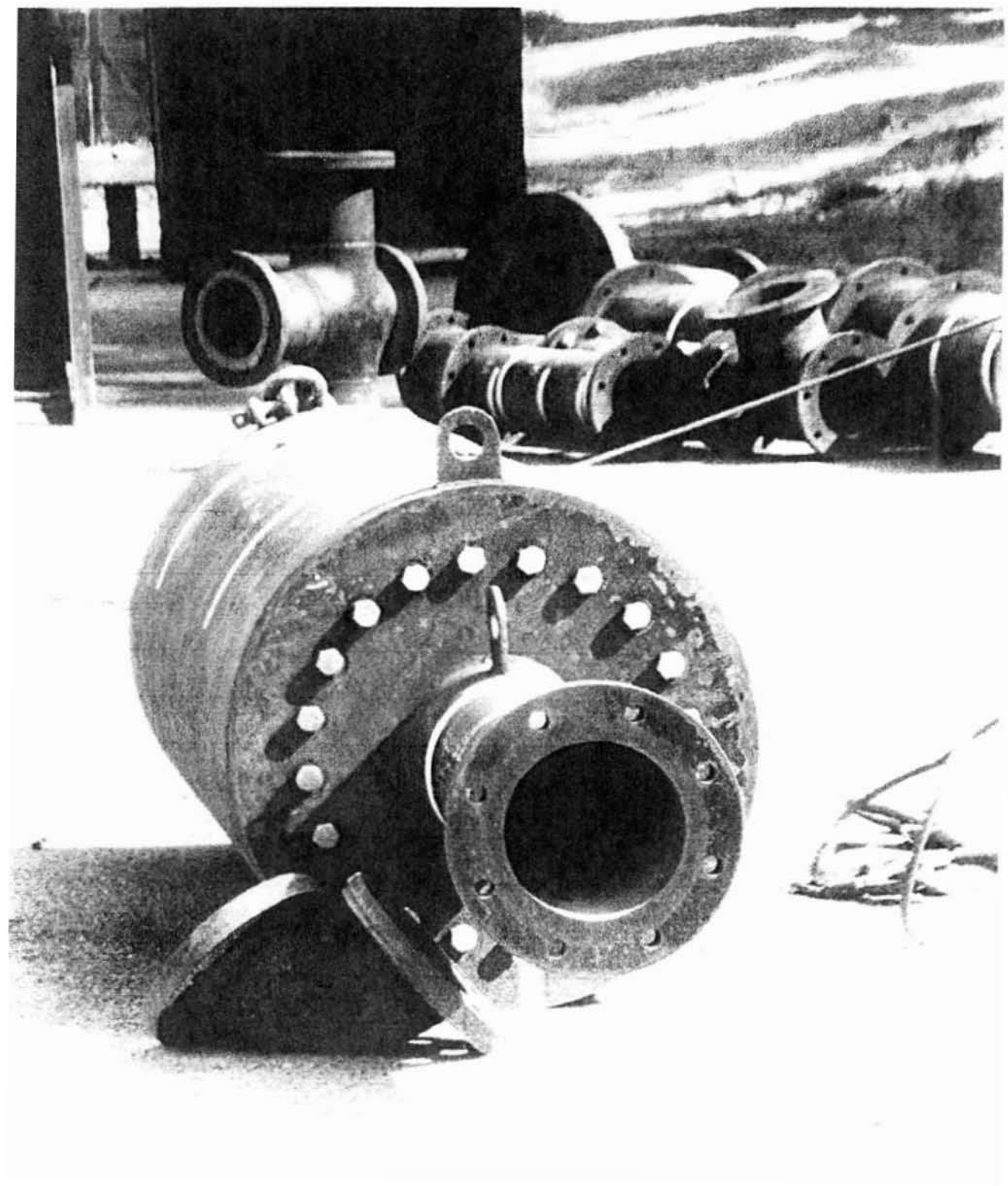
SEVERAL OF THE TECHNICAL RESULTS WILL BE BRIEFED BY THE PANEL MEMBERS.

VIEWGRAPH 9

U.S./ROK PHASE 2 SMALL-SCALE TESTING - 1992-1993

- **CONDUCTED SMALL-SCALE EXPLOSIVE TEST PROGRAM
IN ROK, ADD, TAEJON AND IN U.S., USAEWES**
- **COMPUTER MODEL STUDIES OF CHAMBER/TUNNEL DESIGN
PERFORMANCE**
- **EVALUATED RESULTS OF SMALL-SCALE TESTS AND COMPUTER
MODEL STUDIES**
- **SELECTED BEST DESIGN FEATURES FOR FURTHER STUDY**

VIEWGRAPH 9A



NARRATIVE VIEWGRAPH 10

A SERIES OF TESTS WERE PLANNED USING THE EXPERIENCES OF PHASE 2.

THE U.S. COMPLETED A SERIES OF 6 1/3-SCALE TESTS AT THE LINCHBURG MINE OUTSIDE MAGDALENA, NM. USING SPECIFICALLY DESIGNED CHAMBERS AND TUNNELS, THE SHOTS VARIED FROM 1 KG M³ 31.5#5 TO 42 KG M³ 5,700 #S COMP B EXPLOSIVES. A SECOND SERIES OF TESTS IS ONGOING USING A REDESIGNED TUNNEL COMPLEX BY INCORPORATING AN EXPANSION CHAMBER.

THE ROK HAS CONDUCTED A SERIES OF TESTS AT THEIR TEST SITE USING C4 EXPLOSIVES AT THE 1/8 - 1/5-SCALE.

THEY HAVE INCORPORATED CLOSURE DEVICES AND EXTERNAL BARRICADES. THE TESTING FROM EACH SIDE WAS PLANNED TO COMPLEMENT THE OTHER; E.G., U.S.-DIRECTED MORE TOWARD INTERNAL EFFECTS AND THE ROK TO DEFINE EXTERNAL RESULTS.

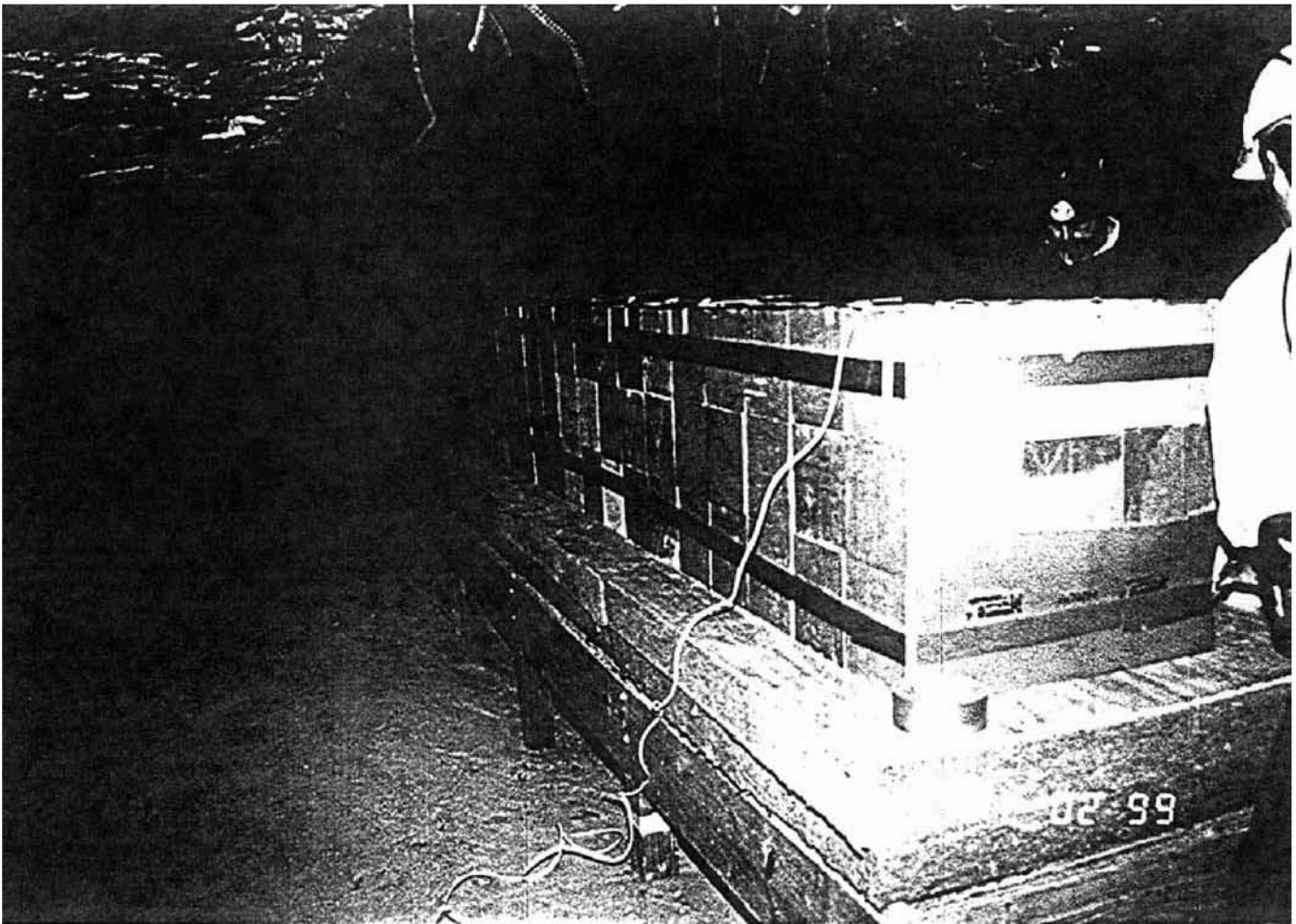
ALL THE WORK WILL RESULT IN A COMPREHENSIVE PHASE 3 REPORT.

VIEWGRAPH 10

PHASE 3 INTERMEDIATE-SCALE TESTING - 1993-1994

- **DESIGNED CHAMBERS AND TUNNELS AS A DIRECT RESULT OF PHASE 2 TESTING PROGRAM**
- **U.S. IS USING AN EXISTING MINE WITH MODIFICATIONS IN NEW MEXICO**
- **ROK HAS CONSTRUCTED A SITE AND TESTED AT YEONCHEON, NORTH OF SEOUL**
- **PHASE 3 REPORT TO FOLLOW THIS YEAR**

VIEWGRAPH 10A



NARRATIVE VIEWGRAPH 11

THE CULMINATION OF ALL THE RESULTS FROM THE TEST APPLICATION IN PHASES 2 AND 3 WILL DEFINE THE PHASE 4 DEMONSTRATION TEST DESIGN.

THIS WILL BE A JOINT DESIGN TEST PLANNED TO OCCUR IN THE U.S. A ½-SCALE TEST IS UNDER CONSIDERATION BY THE TECHNICAL MANAGERS AND THE TAG MEMBERS.

GEOLOGICAL EVALUATION IS ONGOING AT A LOCATION ON THE UTAH TEST AND TRAINING RANGE, NOT TOO DISTANT FROM SALT LAKE CITY, UTAH. THE CURRENT PLANNING USING PHASE 3 RESULTS SHOULD RESULT IN THE LARGER SCALE CONCEPT DEMONSTRATION TEST SOMETIME IN 1995. FOLLOW-ON IN 1996, THEN OF COURSE, WOULD BE THE FINAL CRITERIA ADJUSTMENTS AND FINAL DESIGN DEVELOPMENT AND APPROVALS INVOLVED WITH PHASE 5.

VIEWGRAPH 11

PHASE 4 VALIDATION TESTING - 1995

- **JOINT U.S./ROK PLANNING AT A U.S. TEST SITE**
 - **APPLY ALL PAST RESULTS TO A CONCEPT DEMONSTRATION TEST**
 - **CURRENTLY LOOKING AT A TEST SITE IN UTAH**

NARRATIVE VIEWGRAPH 12

AS A RESULT OF THIS ALMOST 6-YEAR EFFORT, WE EXPECT TO PROVIDE APPLICATIONS FAR BEYOND OUR AMMUNITION STORAGE IN KOREA. ALL OF OUR PAST STORAGE APPLICATIONS AND EXPLOSIVES TESTING CONDUCTED WITHIN THE DEPARTMENT OF DEFENSE, AND THE EUROPEAN COMMUNITY AS WELL, SUPPORTS THE EXPLOSION EFFECTS EXPERTS' CONSIDERATIONS THAT NEW UNDERGROUND STORAGE CONCEPT DESIGNS NOW HAVE THE POTENTIAL TO SOLVE THE EXPLOSION EFFECTS PROBLEMS; AID IN BETTER SECURITY; PROVIDE FOR AMMUNITION SURVIVABILITY; AND RELATE TO COST SAVINGS BY REDUCING THE NEED FOR VALUABLE REAL ESTATE TO SATISFY SAFETY BUFFER ZONES. IT WILL REDUCE ASSOCIATED FACILITY COST INVESTMENT AND GAIN LONG-TERM SAVINGS.

VIEWGRAPH 12

EXPECTED RESULTS

- **SOLUTION TO AMMUNITION STORAGE SAFETY PROBLEM IN KOREA (UNDERGROUND STORAGE)**
 - **ALLOW CONFORMANCE WITH THE STANDARDS, REMOVING THOUSANDS OF U.S./ROK MILITARY AND CIVILIANS FROM RISK**
- **SOLUTION WILL ALSO PROVIDE BONUS BENEFITS**
 - **APPLICABLE WORLDWIDE TO MANY U.S. ARMY, NAVY, AIR FORCE SITES**
 - **MUCH GREATER SECURITY**
 - **MAJOR IMPROVEMENT IN SURVIVABILITY**
 - **ASSURED LONG-TERM COST SAVINGS**

NARRATIVE VIEWGRAPH 13

IN SUMMARY, THIS JOINT RESEARCH AND DEVELOPMENT EFFORT IS ADDRESSING MANY OF THE QUESTIONABLE AND COMPLEX TECHNICAL AREAS SUCH AS EXPLOSION CONTAINMENT, DEBRIS THROW, BLAST OVERPRESSURE MEASUREMENT, AND PREDICTIONS AND GROUND SHOCK APPLICATIONS. SEVERAL OF THE RELATED ACTIVITIES ARE BEING PRESENTED AT THIS SEMINAR BY MESSRS. KIM DAVIS AND CHARLES JOACHIM, WATERWAYS EXPERIMENT STATION, AND DR. SONG OF THE REPUBLIC OF KOREA AGENCY FOR DEFENSE DEVELOPMENT ALONG WITH OTHERS.

BOTH THE U.S. AND REPUBLIC OF KOREA TECHNICAL MANAGERS INTEND TO VISIT THE U.S. PROPOSED VALIDATION TESTING SITE IN UTAH FOLLOWING THIS SEMINAR.

WE ARE EXCITED ABOUT THE RESULTS OF OUR JOINT EFFORTS AND CONSIDER WE HAVE MADE SIGNIFICANT CONTRIBUTION TO UNDERSTANDING UNDERGROUND EXPLOSION EFFECTS. WE FULLY EXPECT TO SHARE ALL THE KNOWLEDGE GAINED WITH THE ENTIRE EXPLOSIVES SAFETY COMMUNITY. THE SUCCESS OF OUR FIRST THREE TEST PHASES AND THE USE OF THE TECHNICAL ADVISORY GROUP MEETINGS SUPPORTS OUR CONTENTION THAT WE ARE CONDUCTING A VERY SUCCESSFUL PROGRAM.

THANK YOU!

VIEWGRAPH 13

SUMMARY

- **JOINT U.S./ROK R&D PROGRAM TO PROVIDE NEW AMMUNITION STORAGE DESIGN CONCEPTS HAS DEMONSTRATED DRAMATIC REDUCTIONS FOR QUANTITY DISTANCE APPLICATION.**
- **PROGRESS HAS BEEN EXCELLENT AND IS EXPECTED TO CONTINUE THROUGHOUT 1996 AND CULMINATE IN APPROVED DOD AND MND DESIGN CONCEPTS.**