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NATIONAL WORKSHOP ON HIGHWAY RESEARCH

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"Effective Use of New Technology"

IT'S GOOD TO SEE LEADERS IN HIGHWAY RESEARCH TACKLING THE PROBLEMS OF THE FUTURE IN A COOPERATIVE WAY.

COMMUNICATION, FACILITATED BY CONFERENCES LIKE THIS ONE, WILL GO FAR IN HELPING EACH INDIVIDUAL DEAL WITH THE PROBLEMS THAT COME HIS OR HER WAY.

IN FACT, COOPERATION AND COMMUNICATION ARE THE PRIMARY CONCEPTS I'M GOING TO SPEAK ABOUT TODAY.

YOU'VE HONORED ME AND MY DEPARTMENT BY ASKING ME TO ADDRESS YOU. I'D LIKE TO RESPOND BY PRESENTING WHAT I KNOW HAS BEEN A GOOD PLAN TO INCREASE THE EFFECTIVE USE OF NEW TECHNOLOGY IN TEXAS.

THE TEXAS DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION IS RECOGNIZED AS HAVING ONE OF THE TOP RESEARCH PROGRAMS IN THE NATION. WE CONDUCT RESEARCH ON SYSTEM AND TRANSIT PLANNING AS WELL AS INVESTIGATING PROBLEMS ENCOUNTERED IN THE DESIGN, CONSTRUCTION, AND MAINTENANCE OF OUR CURRENT HIGHWAY SYSTEM.

CERTAINLY, AMONG THE STATES, WE HAVE THE NATION'S LARGEST RESEARCH PROGRAM IN THE AMOUNT OF FUNDING AND IN THE NUMBER OF PROJECTS. THIS YEAR WE HAVE 125 PROJECTS IN PROGRESS AND A 1988 CONTRACT RESEARCH BUDGET OF 9.3 MILLION DOLLARS.

BUT IMPRESSIVE NUMBERS DON'T ALWAYS MEAN IMPRESSIVE RESULTS. THE REAL BOTTOM LINE IS IMPLEMENTATION.

WHEN A SUCCESSFUL RESEARCH PROJECT PROVIDES US A LOGICAL SOLUTION TO A PROBLEM, IT'S OUR JOB TO PUT IT TO WORK IN THE REAL WORLD, NOT JUST ON PAPER.

I'D LIKE TO SHARE WITH YOU HOW WE IN TEXAS ACHIEVE THAT GOAL.

A CRITICAL FACTOR IN PROMOTING AN EFFECTIVE RESEARCH PROGRAM IS THE INVOLVEMENT OF DECISION-MAKERS.

IN OUR DEPARTMENT, DISTRICT ENGINEERS, DIVISION HEADS, AND TOP ADMINISTRATORS ARE THE FOLKS WHO DECIDE TO TRY NEW IDEAS.

IN THE 20 YEARS I HAVE WORKED WITH OUR RESEARCH PROGRAM IN TEXAS, AND ESPECIALLY IN THE ONE AND ONE-HALF YEARS I HAVE BEEN ENGINEER-DIRECTOR, I HAVE MADE A MAJOR EFFORT TO INVOLVE DECISION-MAKERS IN EVERY PHASE OF THE RESEARCH CYCLE.

IN A DEPARTMENT THAT IS DECENTRALIZED LIKE OURS, IT'S VITAL TO INCLUDE THESE USERS. OUR 24 DISTRICT ENGINEERS, FOR EXAMPLE, ARE RESPONSIBLE FOR DESIGN, CONSTRUCTION, AND MAINTENANCE ACTIVITIES IN THEIR GEOGRAPHIC AREAS.

WE INVOLVE THEM AND THEY IN TURN INVOLVE THE MANY TALENTED PEOPLE IN THEIR ORGANIZATIONS IN IDENTIFYING PROBLEMS FOR RESEARCH. THESE DEPARTMENT LEADERS PUT THESE SUGGESTIONS IN PRIORITY ORDER, AND FOLLOW UP ON THE PROJECTS.

AND IN DOING SO, WE'VE FOUND THEY BECOME MORE THAN READY TO USE NEW IDEAS TO SOLVE OLD PROBLEMS.

THIS OPENNESS DOES NOT COME OVERNIGHT. PEOPLE EVERYWHERE RESIST CHANGE BECAUSE OF INERTIA: BECAUSE OF TRADITION: BECAUSE THEY RATIONALIZE, "WE'VE ALWAYS DONE IT THIS WAY AND IT WORKS FINE."

BUT THROUGH INVOLVEMENT, AND EXPOSURE TO THE BENEFITS OF IMPLEMENTED RESEARCH, THEY BECOME WILLING TO TRY A <u>BETTER</u> WAY.

INVOLVEMENT IS NOT THE ONLY KEY TO SUCCESS, OF COURSE.

IN OUR QUEST FOR THE BEST METHOD OF ADMINISTERING AND USING RESEARCH IN TEXAS, WE'VE COME UP WITH 10 KEY ELEMENTS THAT WE USE TO GUIDE OUR PROGRAM.

YOU COULD CALL THEM THE TEN COMMANDMENTS OF RESEARCH, TEXAS-STYLE.

NUMBER ONE IS: THOU SHALT NOT STRAY FROM THE REAL WORLD IN SELECTING RESEARCH PROBLEMS.

WE USE 95 PERCENT OF OUR CONTRACT RESEARCH BUDGET TO LOOK INTO IN-THE-FIELD PROBLEMS. ONLY FIVE PERCENT GOES INTO BASIC RESEARCH, SUCH AS INTO PROPERTIES OF MATERIALS, AND INTO MANAGEMENT AND POLICY STUDIES.

NUMBER TWO: THOU SHALT NOT DUPLICATE. ALL SIMILAR RESEARCH SHOULD BE CAREFULLY COORDINATED.

THREE: THOU SHALT MONITOR PROGRESS OF RESEARCH AND REDIRECT ITS COURSE IF NECESSARY. REMEMBER ALWAYS THAT RESEARCH MUST SPEAK DIRECTLY TO A REAL PROBLEM.

FOUR: THY RESULTS SHALL BE TIMELY. YOU CAN'T SET AN ABSOLUTE TIME LIMIT ON A PROJECT. BUT THE RESULTS DO NEED TO COME OUT WHILE THEY'RE STILL RELEVANT TO AN EXISTING PROBLEM.

FIVE: THOU SHALT ENSURE THAT RESULTS ARE SIMPLE AND USABLE.

SIX: THOU SHALT PROVIDE CONTINUITY IN THE RESEARCH PROGRAM.

IN THE CASE OF TEXAS, WE USE TWO FACILITIES ALMOST EXCLUSIVELY. TEXAS A&M UNIVERSITY'S TEXAS TRANSPORTATION INSTITUTE AND THE CENTER FOR TRANSPORTATION RESEARCH AT THE UNIVERSITY OF TEXAS ARE NATIONALLY RECOGNIZED AMONG THE VERY BEST IN THE NATION.

WE HAVE USED TEXAS A&M EVER SINCE 1917, IN FACT AND UT SINCE 1963.

OUR CONSTANT USE OF THESE UNIVERSITIES AND THEIR RESEARCHERS GUARANTEES THEM A CONSISTENT LEVEL OF FUNDING. THIS ALLOWS RESEARCH STAFF TO BE MAINTAINED IN MANY FIELDS. WE KNOW THEIR CAPABILITIES, THEY KNOW OUR PROBLEMS, AND WE HAVE CONTINUITY. INCIDENTALLY, IN RECOGNITION OF THIS, A TRULY COOPERATIVE EFFORT, THEY CHARGE US ONLY THEIR DIRECT COSTS PLUS 7% FOR OVERHEAD.

SEVEN: THOU SHALT FULLY DOCUMENT REPORTS FOR DISSEMINATION, AND USE THEM LATER AS A BEGINNING FOR FURTHER RESEARCH.

EIGHT: THY RESEARCH SHALL HAVE THE POTENTIAL TO BE COST BENEFICIAL.

OUR LATEST FIGURES FOR BENEFIT-COST FOR ALL RESEARCH -- INCLUDING NEGATIVE COST-BENEFIT STUDIES -- IS ABOUT 22 TO 1. I KNOW THAT WE HAVE HAD SUCCESSFUL PROJECTS WHOSE SAVINGS COULD ENDOW OUR RESEARCH PROGRAM FOR PERPETUITY.

NINE: THY RESEARCH SHALL NOT ONLY SEEK TO SOLVE PROBLEMS BUT ALSO FIND COST-EFFECTIVE NEW METHODS.

USERS BEING EXHORTED TO CUT COSTS DON'T WANT TO SEE WILDLY EXPENSIVE SCHEMES.

TEN: THY RESEARCHERS SHALL BE AVAILABLE FOR ASSISTANCE IN IMPLEMENTATION OF THE RESULTS.

OUR RESEARCHERS DON'T JUST WRITE THEIR FINDINGS IN A REPORT AND LET THE IMPLEMENTING ENGINEER DIG THEM OUT FOR HIMSELF. THEY GO OUT RIGHT WHERE THE IDEA IS BEING TRIED.

THOSE 10 COMMANDMENTS HAVE HELPED OUR RESEARCH PROGRAM TO ATTAIN ITS MANY ACCOMPLISHMENTS. BECAUSE WE HAVE DEVELOPED A SYSTEM OF PROCEDURES TO PUT THESE COMMANDMENTS TO USE. OUR CURRENT SYSTEM HAS WORKED WELL FOR US FOR YEARS.

TO SHOW HOW IT WORKS, I'D LIKE TO TRACK THROUGH THE SYSTEM ONE OF OUR NEWER INNOVATIONS -- THE LOW COST MAINTENANCE CRASH CUSHION.

THIS ATTENUATOR IS DESIGNED TO TREAT NARROW OBJECTS SUCH AS THE ENDS OF CONCRETE TRAFFIC BARRIERS. IT INCLUDES REUSABLE RUBBER CYLINDERS TO ABSORB FRONTAL COLLISION ENERGY. BEAM FENDER PANELS COMBINE WITH A LATERAL ANCHORAGE SYSTEM TO REDIRECT SIDE IMPACTS.

AFTER AN IMPACT, THE CUSHION USUALLY CAN BE REPAIRED AND RESTORED TO SERVICE IN LESS THAN AN HOUR, FOR LESS THAN 100 DOLLARS. WE STARTED EXPERIMENTAL FIELD INSTALLATIONS THIS PAST SPRING.

THE IDEA HAD ITS GENESIS IN A PROBLEM STATEMENT.

THE DOCUMENTS WE CALL PROBLEM STATEMENTS ARE, PERHAPS, UNIQUE TO THE TEXAS PROGRAM. THEY CALL ATTENTION TO A FIELD PROBLEM THAT MIGHT BE ALLEVIATED BY

RESEARCH.

WE'LL TAKE THESE STATEMENTS FROM ANYONE IN THE DEPARTMENT STATEWIDE, AND ALSO FROM UNIVERSITY RESEARCH GROUPS.

BUT WE DO NOT ALLOW THE UNIVERSITIES TO DICTATE WHAT PROBLEMS THEY WILL RESEARCH FOR US. RATHER, WE IN THE DEPARTMENT IDENTIFY PROBLEMS THAT ARE WORTHY OF OUR RESEARCH RESOURCES.

WE CALL FOR THESE PROBLEM STATEMENTS IN SEPTEMBER, AND WE RECEIVE ABOUT 450 EVERY YEAR.

THEY RANGE FROM 10 PAGES OF DETAILED EXPLANATION TO THREE WORDS, LIKE ONE WE GOT THIS YEAR: "CONTROL THE ANTS," IT SAID.

THE PROBLEM STATEMENT ABOUT THE HIGH COST AND TROUBLE OF REPAIRING ORDINARY CRASH CUSHIONS CAME FROM ONE OF OUR DIVISIONS. WHEN IT CAME IN, WE SENT IT TO ONE OF OUR FOUR AREA ADVISORY COMMITTEES. THESE AREAS REFER TO SUBJECT MATTER, NOT GEOGRAPHY.

AREA I DEALS WITH GEOMETRIC AND ENVIRONMENTAL DESIGN, TRAFFIC, RIGHT-OF-WAY, SAFETY, AND ECONOMICS.

AREA II COVERS MATERIALS, CONSTRUCTION, AND MAINTENANCE.

AREA III IS PAVEMENT DESIGN.

AREA IV IS STRUCTURAL DESIGN.

THESE COMMITTEES ARE THE HEART OF HOW WE INVOLVE DECISION-MAKERS; BECAUSE THE MEMBERS OF THE FIRST 3 COMMITTEES ARE DISTRICT ENGINEERS AND DIVISION HEADS. THE MAKEUP OF THE AREA IV COMMITTEE CONSISTS PRIMARILY OF DISTRICT BRIDGE ENGINEERS.

REGARDING THE FIRST 3 COMMITTEES, EIGHT TO 12 DISTRICT ENGINEERS, FROM OUR 24 HIGHWAY DISTRICTS, SERVE ON EACH COMMITTEE. THEY KNOW FIRST-HAND SOME OF THE SITUATIONS THAT COME TO LIGHT IN THE PROBLEM STATEMENTS.

THE COMMITTEES COMBINE SIMILAR PROBLEM STATEMENTS. THEY PRIORITIZE THE TOP 20 TO 25 PROJECTS IN THEIR AREA OF RESEARCH.

THIS UNIQUE PROCESS ALLOWS THEM, AS USERS, TO SET RESEARCH PRIORITIES.

AFTER REVIEWING THE PROBLEM STATEMENTS, THE COMMITTEES EXPAND THE HIGHEST-PRIORITY PROBLEMS WITH MORE DETAIL.

FROM THERE, EXPANDED PROBLEM STATEMENTS GO TO THE RESEARCH AND DEVELOPMENT COMMITTEE.

THE RESEARCH AND DEVELOPMENT COMMITTEE IS MADE UP OF THE HEADS OF FIVE HEADQUARTERS DIVISIONS -- SPECIALISTS IN AREAS LIKE MATERIALS AND TESTING, BRIDGE, CONSTRUCTION, DESIGN, OR MAINTENANCE -- AND IS CHAIRED BY ONE OF THE DEPARTMENTS DEPUTY DIRECTORS.

THE COMMITTEE, IN CONJUNCTION WITH THE AREA CHAIRMEN, REVIEWS THESE IMPORTANT PROBLEMS AND THEIR PRIORITY RATINGS, DECIDING WHICH ONES TO SUBMIT FOR PROPOSALS FROM UNIVERSITY RESEARCH GROUPS. THE COMMITTEE MEMBERS ALSO RECOMMEND A TIME LIMIT FOR THE STUDY.

IN ADDITION, THE COMMITTEE APPOINTS A HIGHWAY DEPARTMENT CONTACT PERSON FOR EACH PROBLEM.

THIS TECHNICAL COORDINATOR, OR PROJECT MONITOR, COORDINATES PROPOSAL DEVELOPMENT WITH THE RESEARCHER. IN THE CASE OF THE CRASH CUSHION, THE RESEARCHER WAS WITH TTI.

EACH PROPOSAL MUST INCLUDE AN ASSESSMENT OF IMPLEMENTATION POTENTIAL, AND RESEARCHERS ARE ENCOURAGED TO SEEK THE ADVICE OF DEPARTMENT PERSONNEL CONCERNED WITH OPERATIONS IN THE STUDY AREA.

AFTER THE PROPOSALS COME IN FROM RESEARCH GROUPS, THE ENGINEER OF RESEARCH AND DEVELOPMENT REVIEWS THEM IN LIGHT OF THEIR PRIORITY RATINGS AND AVAILABLE FUNDS.

WE FUND 50 TO 75 NEW PROJECTS A YEAR, DEPENDING UPON THE FUNDS AVAILABLE.

THE CRASH CUSHION PROBLEM RANKED HIGH AND HAD A SOUND PROPOSAL, ITS TECHNICAL COORDINATOR RECOMMENDED APPROVAL BY THE R AND D COMMITTEE.

THE COMMITTEE SETS THE OVERALL RESEARCH PROGRAM FOR THE YEAR IN MAY, SUBJECT TO APPROVAL BY THE DEPARTMENT ADMINISTRATION AND THE FEDERAL HIGHWAY

ADMINISTRATION.

THE FHWA HAS BEEN VERY SUPPORTIVE OF OUR PROGRAM, AND WE'VE BEEN PROUD TO WORK WITH THEM, AND PROUD OF THE INNOVATIONS WE'VE PRODUCED. THEIR REPRESENTATIVES FROM THE DIVISION AND REGIONAL OFFICES ARE REGULAR ATTENDEES AT ALL OUR AREA RESEARCH COMMITTEE MEETINGS.

ONCE A PROJECT IS LAUNCHED, THE TECHNICAL COORDINATOR MONITORS THE ONGOING RESEARCH TO ENSURE THAT IT DOESN'T STRAY FROM ITS INTENDED PURPOSE, AND CONTINUES TO EMPHASIZE IMPLEMENTATION.

SINCE IN TEXAS WE DO NOT AWARD RESEARCH GRANTS, BUT CONTRACTS TO SOLVE A SPECIFIC PROBLEM, WE CAN MORE EASILY MONITOR AND REDIRECT THE RESEARCH IF NEEDED.

THE AREA COMMITTEES MEET TWICE A YEAR TO HEAR REPORTS ON RESEARCH IN PROGRESS FROM THE RESEARCHERS THEMSELVES, AND FROM THE TECHNICAL COORDINATORS.

ANOTHER KEY TO THE SUCCESSFUL PARTICIPATION OF OUR TOP PEOPLE IS THE TYPE AND LOCATION OF THESE COMMITTEE MEETINGS. THE MEETINGS ARE HELD AT VARIOUS LOCATIONS AROUND THE STATE. IN FACT, IT IS NOT AT ALL UNUSUAL TO HAVE SEVERAL RETIRED DISTRICT ENGINEER'S OR DIVISION HEAD'S CONTINUE TO ATTEND THESE MEETINGS ACROSS THE STATE, AT THEIR OWN EXPENSE, BECAUSE OF THEIR INTEREST IN THE PROGRAM.

THESE REPORTS ALWAYS INCLUDE ASSESSMENTS OF POTENTIAL IMPLEMENTATION OF THE RESEARCH.

AFTER THE STUDY DETAILING THE NEW CRASH CUSHION CAME OUT, SPECIFICATIONS AND EXPLANATIONS WERE SENT TO ENGINEERS IN THE FIELD WHO MIGHT BE ABLE TO USE IT.

WE ALSO TRY TO DISSEMINATE NEW INFORMATION LIKE THIS THROUGH PERSONAL CONTACT AND DEMONSTRATIONS.

NOW, WHILE THE CRASH CUSHION IS BEING TESTED IN THE FIELD, THE COMMUNICATION FLOW CONTINUES.

FOR THREE YEARS AFTER COMPLETION OF THE STUDY, THE TECHNICAL COORDINATOR WILL CHECK UP ON HOW WELL THE NEW IDEA IS BEING USED.

HE WILL DESCRIBE IN HIS REPORTS ANY MEANS USED TO AID IMPLEMENTATION, AND COMMENTS ON WHETHER OTHER STATES WILL BE ABLE TO BENEFIT.

THIS SYSTEM OF COMMITTEES AND REPORTS WORKS WELL. BUT AMID THE DETAILS WE MUST BE CAREFUL NOT TO LET OUR OVERRIDING GOALS GET LOST.

IF I MAY CONTINUE THE BIBLICAL ANALOGY STARTED WITH OUR "TEN COMMANDMENTS OF RESEARCH," I THINK PERHAPS THERE ARE TWO GREAT RESEARCH COMMANDMENTS THAT ENCOMPASS ALL THE OTHERS:

COOPERATE.

COMMUNICATE.

WE COOPERATE IN RESEARCH WITH THE UNIVERSITIES.

WE ENCOURAGE COOPERATION AMONG RESEARCHERS, ENGINEERS, AND ADMINISTRATION.

AND THE ONLY WAY TO COOPERATE EFFECTIVELY IS TO COMMUNICATE. WE HAVE TO KEEP EVERYONE INFORMED OF WHAT IS BEING DONE AND WHAT OUR GOALS ARE.

WE'VE BEEN SUCCESSFUL IN REDUCING THE LEVEL OF "RESEARCHESE" USED IN MEETINGS WITH ENGINEERS AND ADMINISTRATION.

RESEARCHERS NOW ARE ACCUSTOMED TO TALKING TO OUR COMMITTEES, NOT JUST TO OTHER RESEARCHERS.

WHEN GIVING REPORTS, THEY NOW TRY TO SPEAK IN TERMS EASILY UNDERSTOOD BY BUSY PEOPLE CONCERNED WITH DAY-TO-DAY BUSINESS.

THIS COMMUNICATION FLOW CONTINUES WHEN A PROJECT IS IMPLEMENTED, AND EVEN BEYOND.

WE WANT OUR RESEARCHERS TO BE AVAILABLE TO THE DISTRICTS FOR CONSULTATION ON MATTERS OTHER THAN THEIR SPECIFIC RESEARCH CONTRACT. THIS PRODUCES A MORE

CASUAL, TWO-WAY FLOW OF COMMUNICATION.

WE'VE HAD TTI AND CFTR PUT ON TRAINING SESSIONS ACROSS THE STATE. THE SESSIONS WERE TO EDUCATE OUR PERSONNEL ON HOW TO USE NEW TECHNOLOGY. FOR EXAMPLE, THEY TRAINED HUNDREDS OF ENGINEERS AND TECHNICIANS IN THE USE OF HOT MIX ASPHALTIC CONCRETE.

COMMUNICATION IS ALSO IMPORTANT TO SOLVE PROBLEMS BEFORE THEY EVER GET TO THE ACTUAL RESEARCH STAGE. IT IS, IN FACT, ONE OF THE PRIMARY FUNCTIONS OF THE RESEARCH AND DEVELOPMENT SECTION OF OUR TRANSPORTATION PLANNING DIVISION.

IN ADDITION TO COORDINATING OUR SYSTEM OF AWARDING RESEARCH CONTRACTS, THE R AND D SECTION HAS THREE FIELD PEOPLE WHO TRAVEL TO THE DISTRICTS.

THEY ASSIST IN IDENTIFYING PROBLEMS AND FINDING SOLUTIONS. MANY PROBLEMS ENCOUNTERED IN THE FIELD HAVE ALREADY BEEN RESEARCHED BY SOMEONE, AND THE INFORMATION IS OUT THERE TO BE USED.

THAT'S WHERE THE TECHNOLOGY TRANSFER BRANCH, CONSISTING OF FOUR PEOPLE, COMES IN.

THE BRANCH COLLECTS AND DISSEMINATES RESEARCH INFORMATION BOTH INSIDE AND OUTSIDE THE DEPARTMENT.

IT ALSO CONVERTS TECHNICAL PUBLICATIONS INTO EVERYDAY LANGUAGE -- TURNING RESEARCH REPORTS INTO USER MANUALS, FOR EXAMPLE.

TECHNOLOGY TRANSFER MAINTAINS A TECHNICAL LIBRARY WITH 12,000 PUBLICATIONS. THEY'RE NOW AUTOMATING THE LIBRARY, SO DISTRICTS CAN ACCESS IT THEMSELVES FROM ALL OVER TEXAS.

THEY CAN ALSO SEEK INFORMATION WITH A DIALOG COMPUTER HOOKUP TO 120 DIFFERENCE DATABASES IN ALL FIELDS, INCLUDING TRADITIONAL TRANSPORTATION DATABASES.

AN EXAMPLE OF THE BENEFITS OF SUCH COMMMUNICATION LINKUPS OCCURRED IN

OUR LUFKIN DISTRICT IN EAST TEXAS.

A TIGHT CURVE NEEDED STRAIGHTENING, AND THE NEW ROADWAY WOULD PASS CLOSE TO A CHICKEN HATCHERY.

THE CHICKEN HATCHERS GOT ALL UP IN ARMS, CLAIMING THE TRAFFIC WOULD INTERFERE WITH EGG-LAYING. THE WHOLE CLUCKING MESS HAD TO GO TO A CONDEMNATION HEARING.

HOW COULD THE DEPARTMENT PROVE THAT THE ROAD WOULDN'T UPSET THE HENS? WE COULD HAVE COMMISSIONED A CHICKEN STUDY TO THAT EFFECT, BUT WE DIDN'T HAVE TO.

AN INFORMATION SEARCH USING THE DATABASE FOUND A STUDY ON THIS VERY TOPIC -- THE EFFECT OF NEARBY TRAFFIC ON EGG-LAYING.

TURNED OUT THE EFFECT WAS MINIMAL, AND OUR WAY WAS CLEARED.

WE DO THE SAME KIND OF INFORMATION SEARCH WHEN A RESEARCH PROPOSAL COMES UP, TO ENSURE THAT NO PART OF THE RESEARCH WILL DUPLICATE PREVIOUS STUDIES.

WE PUT OUR ONGOING RESEARCH AND FINDINGS INTO A DATABASE SO OTHER STATES DON'T HAVE TO DUPLICATE US, EITHER.

TECHNICAL COORDINATORS PROVIDE ANOTHER HEDGE AGAINST DUPLICATION. IF TWO OF OUR PROJECTS ARE SIMILAR, OR IF DIFFERENT PHASES OF THE SAME PROJECT ARE CONDUCTED IN SEPARATE PLACES, THE SAME COORDINATOR OVERSEES BOTH.

ALL THESE SAFEGUARDS AGAINST DUPLICATION KEEP US FROM WASTING TIME AND MONEY.

AND SO OUR ENGINEERS -- OUR USERS -- KNOW THAT THE RESEARCH WE DO IS NEVER UNNECESSARY. EVEN WHEN WE COME OUT WITH A NEGATIVE FINDING, THEY KNOW IT'S VALUABLE.

THEY KNOW THAT WHEN THE RESEARCHERS PRESENT THEM WITH RESULTS, WE'VE SPENT OUR MONEY WISELY.

WE HAVE STEADILY INCREASED OUR RESEARCH BUDGET OVER THE PAST SEVERAL YEARS.

OUR TECHNOLOGY USERS KNOW THAT MONEY IS NOT SPENT ON CASTLES IN THE AIR, BUT ON HIGHWAYS ON THE GROUND -- GETTING REAL SOLUTIONS TO REAL PROBLEMS.

WE SEEK TO MAKE NEW TECHNOLOGY COMING OUT OF RESEARCH PROJECTS EASY TO USE.

I HOPE THAT ONE DAY COOPERATION AND COMMUNICATION WILL HELP RESEARCHERS AND USERS ALL OVER THE COUNTRY PUT NEW TECHNOLOGY INTO THE FIELD.

TO MEET THE TRANSPORTATION CHALLENGES OF THE NEXT DECADE AND THE NEXT CENTURY, WE'LL NEED ALL THE NEW IDEAS WE CAN GET.

WE CAN'T AFFORD TO LET THOSE IDEAS GET BOGGED DOWN IN MISUNDERSTANDINGS AND MISAPPLICATIONS.

AND THEY WON'T, IF INSTEAD OF BEING MERELY THE RECIPIENTS OF IDEAS THAT THE RESEARCH PROCESS HAS GENERATED, USERS ARE MADE A VITAL PART OF THE PROCESS.

AND BESIDES, WHERE COULD YOU POSSIBLY FIND A BETTER LABORATORY THAN THE 73,000 MILES OF HIGHWAY ON OUR STATE MAINTAINED SYSTEM IN TEXAS?