AVIATION SECURITY
EMERGING TECHNOLOGIES

DRIVERS FOR INNOVATION

DYNAMIC THREAT SPACE

- EARLY STAGES MILITARY AND COMMERCIAL EXPLOSIVES

SUBSEQUENT INTRODUCTION

- HOME MADE EXPLOSIVES, SOLIDS AND LIQUIDS

DYNAMIC CONCEALMENT

- PAN AM 103 CHECKED LUGGAGE

- PERSON BORNE THREATS (CHECHEN WIDOWS)
- SHOE BOMBER
- UNDERWEAR BOMBER
- PRINTER CARTRIDGE

DETECTION TECHNOLOGY ACQIUISITION AND DEPLOYMENT

- POST INCIDENT

DIFFICULT TO PREDICT FUTURE INCIDENTS

SPECIAL CASE WHERE AN EFFECTIVE SOLUTION WAS

DEVELOPED AND SUCCESSFULLY DEPLOYED USED TO DETECT

INGESTED NARCOTICS BASED ON TRANSMISSION XRAYS

VERY EFFECTIVE AGAINST INTERNAL THREAT CONCELAMENT

BUT UNLIKELY TO BE DEPOYED EXCEPT FOR EXTREME

CONDITIONS- CONSIDERABLE HEALTH AND SAFETY AND

PRIVACY OPPOSITION. DEPLOYED IN OTHER COUNTRIES.

THE SECOND CRITICAL DRIVER FOR NEW TECHNOLOGY

ECONOMICS AND TOTAL COST OF OWNERSHIP.

ONLY RECENTLY HAS ATTENTION BEEN FOCUSED ON EXTENSIVE LABOR COSTS

CONSUMABLES SUCH AS SWABS FOR TRACE, NOT A SGINIFICANT FACTOR BUT LABOR IS.

EXAMPLE OF LABOR COSTS

TSA DATA FEDERAL REGISTER

Year	Passenger Opt Outs	Industry Utilities	TSA Costs				Total
			Personnel	Training	Equipment	Utilities	
2008	$7.0	$5.7	$14,689.1	$389.5	$37,425.2	$18.8	$52,535.3
2009	$32.2	$5.7	$15,618.6	$88.0	$42,563.6	$20.4	$58328.5
2010	$262.2	$158.2	$247,566.7	$5,332.8	$119,105.4	$241.4	$372,666.6
2011	$1,384.2	$186.7	$284,938.7	$15,354.4	$55,567.2	$269.1	$357,700.2
Total	**$1,685.6**	**$356.3**	**$562,813.0**	**$21,164.7**	**$254,661.3**	**$549.6**	**$841,230.6**

LABOR COSTS ASSOCIATED WITH RESOLVING FALSE ALARMS AT CHECKPOINT AND FOR CHECKED LUGGAGE ARE ESTIMATED TO BE SIMILAR IF NOT EXCEED.

AT SEVERAL HUNDRED MILLION DOLLARS PER YEAR IN LABOR COSTS, THE PROMISE OF SAVINGS THRU IMPROVED OR INNOVATIVE TECHNOLOGY IS CONSIDERABLE

TECHNOLOGY INNOVATIONS

CHECKED LUGGAGE EDS

ALTERNATIVE DESIGN NON ROTATING GANTRY MADE POSSIBLE BY RECENT ADVANCES IN ITERATIVE RECONSTRUCTION WHEREAS THE CONVENTIONAL WISDOM CALLED FOR 700 TO 1000 VIEWS, IT SEEMS THE LESS THAN 100 WOULD BE ADEQUATE. SYSTEMS WITH NOVELIGNS ARE VERY PROMSING AND NEAR CERTIFICATION.
THIS IS A TRANSFER FROM MEDICAL APPLICATIONS

NOVEL XRAY SOURCES ALLOW FOR NEW EDS DESIGNS
TRIPLE RING SOURCES, XINRAY CARBON NANOTUBE SOURCES

NOVEL COHERENT SCATTER SYSTEMS AND NON ROTATING GANTRY EDS HOLD PROMISE FOR CONSIDERABLY LOWER FALSE ALARM RATES, HIGH TRHOUGHPUT AND LOWER MAINTENACE COSTS OVER TRADITIONAL ROTATING GANTRY SYSTEMS.

MULTI ENERGY DETECTORS HAVE YET TO PROVE VALUE BUT CAN SEE INCREASING USE (REDLEN AND MULTIX)

TIME FRAME 1 TO 3 YEARS.

CHECKPOINT SYSTEMS.

SLOWLY DESKTOP CT SYSTEMS ARE BECOMING COMERCIALLY AVAILABLE AND MAY FIND A REPALCEMENT NICHE TO DEPLOYED TRACE SYSTEMS. THESE SYSTEMS ARE NOW DEPLOYED IN EUROPE AND ARE VERY EFFECTIVE FOR LIQUID SCREENING AND

APPLICABLE TO FALSE ALARM RESOLUTION AT CHECKED LUGGAGE AS WELL.
S&T HAS AN ACTIVE PROGRAM IN THIS AREA.

ALTHOUGH BACKSCATTER XRAY HAS FAR BETTER RESOLUTION

THAN COMPETING MMWAVE PORTALS, BACKSCATTER FAILED

DUE TO LACK OF EFFECTIVE AUTOMATED ALGORTIHM

CAUSED BY THE PUBLIC PRESSURE OF THE RAW BACKSCATTER

IMAGES PUBLICIZED IN EARLY STAGES.

BACKSCATTER IS BY NO MEANS RULED OUT, THERE MIGHT BE SOME DEPLOYMENT IN THE FUTURE.

HIGHER FREQUENCY MMWAVE AND THZ SYSTEMS ARE BEING DEVELOPED WITH PROMISE OF HIGHER RESOLUTION, SHARPER IMAGES AND GREATER ATR ACCURACY (RHODES AND SCHWARTZ IN GERMANY, NOVATRANS IN ISRAEL)

DESIRABLE FEARTURES, FASTER THROUGHPUT (240 PASSENGERS PER HOUR) WALK THRU INSTEAD OF STOP AND IMAGE.

AT XRAY SYSTEMS WERE ACQUIIRED AND DEPLOYED AS A RESPONSE TO THE LIQUID PLOT IN THE UK, THE PREVIOUSLY DEPLOYED SINGLE VIEW TRX SYSTEMS WERE UNABLE TO PROVIDE SUFFICIENT INFORMATION TO DETERMINE DENSITY

WITH ACCURACY ENOUGH TO DISTINGUISH LIQUID THREATS FROM COMMON ITEMS.
THE initial SELCTION WAS FOR THE 4 VIEW STEM BUT EVENTUALLY 2 AND 3 VIEW SYSTEMS WERE DEPLOYED.
THE DRAWBACK WAS THE CONTINUED REQUIREMETNS TO DIVEST, LIQUIDS AND LAPTOPS.

NOVEL XRAY SOURCES MAY EXPLOIT THE NEW XRAY SOURCES TO DEVELOP AT ARCHITECTURE WITH MANY VIEWS, 100 OR HIGHER RESULTING IN SUFFICIENT INFORMATION WHICH WHEN COUPLED WITH ITERATIVE RECONSTRUCTION CAN PROVIDE CT QUALITY SCREENING (XINRAY HAS DEVELOPED PROTOTYPES UNDER DHS SPONSORSHIP
OTHER SMALL FOOTPRINT CT SYSTEMS WHICH FIT IN THE HEIGHT, WEIGHT AND FOORTPRINT REQUIREMETNS ARE BEING DEVELOPOED BY IDSS.
THESE NOVEL CT EDS SYSTREMS WOULD PERMIT PASSENGERS TO STOP DIVESTING LIQUIDS AND LAPTOPS AT CONSIDETRABLE SAVINGS IN LABOR.

STANDOFF SCREENING AT MASS TRANSIT OR AIRPORT ENTRY CONTINUES TO BE A CHALLENGE.

EFFECTIVE SHOE SCANNERS TO ALLOW PASSENGERS TO KEEP

SHOES ON REMAINS ELUSIVE.
STANDLONE IS NOT DESIRABLE BUT HAS TO BE INTEGRATED AT the CHECKPOINT WITH AIT PORTALS.

TSA PREFERS INTEGRATED SOLUTIONS RATHER THAN STANDALONE SYSTEMS.

THIN PLASTIC THREATS PLACED ON THE BODY IN SELECTED LOCATIONS REMAIN A CHALLENGE TO BE RESOLVED. THIS IS TRUE FOR BOTH BACKSCATTER AND MMWAVE

TRACE SYSTEMS

A NEGATIVE RESPONSE FROM A TRACE SYSTEM IS NOT AN ABSOLUTE INDICATION OF ABSENCE OF A THREAT.
A POSITIVE RESULT HOWEVER IS A CONSIDERABLE CAUSE FOR ALARM. TRACE FALSE ALARMS ARE RELATIVELY LOW AND MOST OFTEN ASSOCIATED WITH NITRATE RESIDUE FROM AGRICULTURAL ACTIVITY.

IT IS NOT ASSURED THAT TRACE WOULD CONTINUE TO BE EFFECTIVE IN AVIATION SECURITY. MOST LIKELY IS THE SOPHISTICATION OF THE NEWER DEVICES AND THE ABILITY TO HERMETICALLY SEALED THE THREAT TO ELIMINATE EXTERNAL RESIDUE OR CONTAMINATION.

IT IS DIFFICULT TO ASSESS THE LEVEL OF CONTAMINATION THAT MIGHT BE EXPECTED, GIVEN THIS FACT, TRACE SYSTEMS WITH MUCH HIGHER RESOLUTION AND LEVELS OF DETECTION ARE BEGINNING TO APPEAR AND MAY REACH DEPLOYMENT IN THE NEAR FUTURE.

IN ADDITION, TWO OTHER DEVELOPMENTS, THE MIGRATION OF MASS SPECTROSCOPY FROM THE LAB TO THE FIELD. AS A DEFINITIVE METHOD MS IS THE GOLD STANDARD OF ANALYTICAL WORK (SYSTEMS BASD ON TIME OF FLIGHT TOF FROM MORPHO AND QUADRUPOLE TRAPS FROM FLIR ARE

REACHING CERTIFICATION)

THE OTHER MAJOR AREA OF INNOVATION IS SAMPLE PRESENTATION TO THE INSTRUMENT.
IDEALLY NON CONTACT TRACE IS DESIRABLE, THIS AVOIDS THE SUBJECTIVE METHOD OF MANUAL SWABS AND MANUAL HARVESTING OF RESIDUES.

COSTS ARE MOSTLY LABOR RATHER THAN THE CONSUMABLES.

ON THE FAR FIELD DOMAIN, OPTICAL METHODS SHOW PROMISE, THE ABILITY TO SCAN OBJECTS FROM A DISTANCE OF 10 FEET OR HIGHER AND BE SENSITIVE AND SELECTIVE EVEN IN THE PRESENCE OF A LARGE NUMBER OF AMBIENT NUISANCE CHEMICALS.

ISSUES SUCH AS INSPECTION AREA AND RASTER FREQUENCY ARE MAIN OBSTACLES. EYE SAFE LASERS ARE CRITICAL.

THESE SYSTEMS ARE PREFERABLE TO CURRENT METHODS OF SCREENING CARS AND PASSENGERS FROM A DISTANCE. THIS MAYBE A MILITARY AND LAW ENFORCEMENT RATHER THAN AVIATION

IT IS NOT THE ACQUISITION COST, IT IS THE OPERATIONAL AND ASSOCIATED LABOR COSTS.