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ENERGY AND U.S. AIRLINE TRAFFIC

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S. L. HIGGINBOTTOM REMARKS

WHEN CHARLES CARY ASKED US TO PARTICIPATE IN THIS SESSION, HE OFFERED US NOT ONLY A CHOICE OF DATES BUT ALSO A QUITE CLEAR SELECTION OF SUBJECTS ON CONDITION THAT THEY WERE OF INTEREST TO AIR-TRANSPORT SPECIALISTS AND, IF POSSIBLE, ADDRESSED FUEL PROBLEMS.

WE IN ROLLS-ROYCE INC. DO MAINTAIN A CLOSE EYE ON THE WORLD AIRLINE SCENE, BUT OUR ANALYTICAL EFFORTS TEND TO BE LIMITED TO THE NORTH AMERICAN MARKETS AND OUR EXAMPLES OF ANALYSIS AND PLANNING ARE, IN THE MAIN, DRAWN FROM THE DOMESTIC ENVIRONMENT. WHILST WE ARE OPTIMISTIC ABOUT THE MIDDLE- TO LONG-TERM FUTURE OF THE U.S. AIRLINE INDUSTRY, IT WOULD BE FOLLY TO ATTEMPT TO BE SO ABOUT THIS YEAR OR NEXT.

THERE IS LITTLE DOUBT NOW THAT THE UNITED STATES IS IN THE MIDST OF ITS MOST SERIOUS ECONOMIC CRISIS SINCE WORLD WAR 2. FIVE FACTORS ARE OF CONCERN: THE WORLD BALANCE OF POWER, INFLATION, ENERGY SUPPLY AND CONSERVATION, LAGGING CAPITAL FORMATION, AND PRODUCTIVITY. NONE OF THEM CAN BE TREATED IN ISOLATION BECAUSE THE PHENOMENAL RISE IN ENERGY COSTS HAS BEEN THE CAUSE OF ALMOST EVERYTHING ELSE. THE PROGRESS FROM BEING A NET EXPORTER OF OIL TO BEING THE WORLD'S GREATEST IMPORTER PASSED WITHOUT SERIOUS ATTENTION FROM THE FEDERAL GOVERNMENT UNTIL OPEC BROUGHT IT FORCIBLY TO ITS ATTENTION SEVEN OR EIGHT YEARS AGO.

WE HAVE PREPARED A PAPER WHICH ENDEAVORS TO LOOK AT THE ENERGY SITUATION AND ALSO TO ASSESS THE LIKELY MOVES IN AIRLINE PROCUREMENT GENERATED BY THE CHANGING ENERGY SCENE. ONCE PAT BURGESS HAS COMPLETED HIS TALK, WE WOULD BE HAPPY TO FIELD ANY QUESTIONS IT MIGHT GENERATE.

ENERGY AND U.S. AIRLINE TRAFFIC

INTRODUCTION

THE U.S. AIRLINE INDUSTRY HAS BEEN EXPOSED TO A PERIOD OF MAJOR SURGERY DURING THE PAST THREE YEARS AND HAS SURVIVED. VIEWED FROM THE STANDPOINT OF THE CAB, IT WAS NATURAL THAT THE GREAT IMPROVEMENT IN PROFITABILITY WHICH OCCURRED IN THE FIRST TWO YEARS BE DIRECTLY ATTRIBUTED TO THE SURGERY WHILST THE DOWNTURN THIS YEAR WAS CAUSED BY THE CYCLICAL NATURE OF THE BUSINESS. OTHERS BELIEVE THAT THE UPTURN IN PROFIT WOULD HAVE BEEN EVEN MORE DRAMATIC HAD IT NOT BEEN FOR THE ACTIVITIES OF THE CAB AND THAT THE DOWNTURN WAS GENERATED BY FARCICAL TARIFF STRUCTURES. WHATEVER THE POSTMORTEM ON THE LATE 1970'S REVEALS, DEREGULATION IS NOW INEVITABLE ALTHOUGH ITS TOTALITY REMAINS IN DOUBT; CYNICS TEND TO BELIEVE THAT CONGRESS AND THE ADMINISTRATION WILL SHY AWAY FROM THE FINAL ACT OF COMPLETELY DEMOLISHING THE CAB.

THE 1979 IRANIAN COUP GENERATED ONE MORE ENERGY CRISIS WITHIN THE UNITED STATES. IT, AND SUBSEQUENT FEDERAL ACTIONS, ARE UNLIKELY TO CREATE AN EXTENDED SHORTAGE OF PETROLEUM PRODUCTS IN THE UNITED STATES BUT HAVE PRODUCED A SIGNIFICANT INCREASE IN ENERGY COSTS WHICH WILL CONTINUE TO INCREASE.

THE AIRLINE INDUSTRY IS ONLY A MINOR USER OF LIQUID HYDROCARBONS BUT IS NONETHELESS HIGHLY VISIBLE. ITS USE OF ABOUT 4 TO 5 PERCENT OF THE U.S. TOTAL CONSUMPTION OF OIL LEADS TO

TO MORE CONTROVERSY THAN IS THE CASE IN ALMOST ANY OTHER CONSUMER SEGMENT; AS ONE POLITICAL COMMENTATOR PUT IT, "AIRLINES DON'T HAVE MANY VOTES." IN CONSEQUENCE, THE INDUSTRY'S LONG-TERM PLANS TEND TO SUFFER PERTURBATIONS DEPENDENT UPON BOTH THE FUEL SITUATION AND POLITICAL ACTIVITY RESULTING THEREFROM.

THERE IS HEIGHTENED CONCERN IN THE UNITED STATES THAT THE DETERIORATION IN IRANIAN OIL SUPPLY, THE PRESENT GLUT, AND THE DOWNTURN IN THE ECONOMY MAY RESULT IN AN EXTENDED SHORTAGE AS MORE OPEC SUPPLIERS CURTAIL PRODUCTION IN THE INTERESTS OF INCREASING PRICES AND CONSERVING THEIR RESOURCES. SOME OF THE RECENT U.S. GOVERNMENTAL DECISIONS ARE AIMED AT REPLACING IMPORTED OIL WITH ADDITIONAL DOMESTIC PRODUCTION; OTHERS ARE DIRECTED AT REDUCING DOMESTIC DEMAND. WHILST REDUCTION IN SUPPLY, EVEN OF A TEMPORARY NATURE, WOULD OBVIOUSLY SEVERELY AFFECT THE AIRLINE INDUSTRY, A REAL GASOLINE SHORTAGE WOULD HAVE A MORE PERVASIVE EFFECT ON THE WHOLE ECONOMY AND WOULD GENERATE SECOND-ORDER CHANGES IN MANY ASPECTS OF U.S. LIFE. THE OBJECT OF THIS LECTURE IS TO REVIEW THE LIKELY EFFECTS OF CHANGING U.S. OIL POLICIES ON THE U.S. AIRLINE INDUSTRY.

ENERGY AND THE UNITED STATES

FOR MANY YEARS THE UNITED STATES ENJOYED THE ADVANTAGES OF HAVING CHEAP ENERGY IN ABUNDANCE AVAILABLE WITHIN ITS OWN BORDERS, AND IT DEVELOPED THE MOST ADVANCED ECONOMY IN THE WORLD BY EXPANDING ITS DEMAND IN LINE WITH AVAILABILITY. AS THE CHART

IN FIGURE 1 DEMONSTRATES, IN MOST OF THE WORLD THERE IS A DIRECT RELATIONSHIP BETWEEN PER-CAPITA GNP AND ENERGY USAGE, WITH CANADA AND THE U.S. BEING TWO QUITE EXCEPTIONAL OIL USERS. THE EARLY ACHIEVEMENT OF AN EXTREMELY HIGH STANDARD OF LIVING IN THE U.S. AND CANADA WAS BASED UPON AN INORDINATELY HIGH CONSUMPTION OF THE, THEN, READILY AVAILABLE CHEAP OIL AND GAS.

IN A NATION WHERE "DEREGULATION" HAS BECOME A CATCHPHRASE FOR EVERYTHING, ENERGY, WHICH HAS BEEN THE CORNERSTONE OF U.S. WEALTH, HAS BEEN REGULATED AT EVERY STAGE. UNFORTUNATELY, THE POLITICAL PRESSURES WHICH HAD BROUGHT ABOUT THE ORIGINAL REGULATION WERE PRESENT AT A TIME WHEN THE NATION WAS A NET EXPORTER OF ABUNDANT, CHEAP OIL. AS IS ALMOST ALWAYS TRUE IN POLITICAL TERMS, WHEN THE CIRCUMSTANCES THAT SURROUNDED THE INITIAL BAD DECISION CHANGED, THE INEVITABLE LEGISLATIVE REDRAFTING COMPOUNDED THE UNREASONABLENESS OF THE POLICIES. IN CONSEQUENCE, THE POLITICIANS FAILED TO RECOGNIZE THAT, AS IS TRUE OF ANY FINITE RESOURCE, WHEN STOCKS ARE DEPLETED, PRICES SHOULD RISE. EVEN IN THE 1950'S, A SIGNIFICANT NUMBER OF DOMESTIC OILWELLS HAD CEASED PRODUCTION BECAUSE THE COST OF PRODUCTION EXCEEDED THE PRICE CEILING WHICH CONGRESS HAD PLACED UPON DOMESTICALLY PRODUCED CRUDE OIL. THE EASY AVAILABILITY OF CHEAP MIDDLE EAST OIL COMPELLED THE OIL COMPANIES TO IMPORT TO SUSTAIN THE ARTIFICIALLY STIMULATED DEMAND; EVEN WORSE, PRICE CONTROLS LEFT IN FORCE FOR TOO LONG CREATED A SITUATION IN WHICH THE OIL COMPANIES ACTUALLY MADE MORE MONEY BY GENERATING A DEPENDENCE ON FOREIGN IMPORTS.

FOR THE PAST FIFTEEN YEARS, THE UNITED STATES HAS BEEN A NET IMPORTER OF OIL, DISPLAYING INCREASING DEPENDENCE ON THE MIDDLE EAST. UNFORTUNATELY, AT THE SAME TIME AS IT WAS BECOMING THE WORLD'S BIGGEST OIL IMPORTER, THE UNITED STATES WAS PURSUING A FOREIGN POLICY WHICH ALIENATED IT FROM THE ONLY AVAILABLE EXPORTERS, THE ARABS. BY SKILLFUL USE OF OIL AS AN ECONOMIC WEAPON, THE OPEC COUNTRIES HAVE, AT LAST, SEEN A SHIFT IN U.S. FOREIGN POLICY, BUT ONLY AFTER AN EIGHT- OR TENFOLD INCREASE IN THE PRICE OF CRUDE OIL, A MAJOR ADVERSE TRADE BALANCE IN THE UNITED STATES, A RUN ON THE DOLLAR, AND CHRONIC RECURRENCES OF REAL OR IMAGINED FUEL CRISES.

THE DECISION BY OPEC, IN 1973, TO PLACE A TEMPORARY EMBARGO ON OIL EXPORTS TO THE UNITED STATES REPRESENTED A MAJOR POLITICAL MILESTONE. THE RECOGNITION BY THE ADMINISTRATION OF AN ALIEN-DEPENDENT DOMESTIC ECONOMY HAD A DRAMATIC SHORT-TERM EFFECT, AS CAN BE SEEN IN FIGURE 2. OIL CONSUMPTION DROPPED BY ABOUT ONE MILLION BARRELS PER DAY WITH NO ASSOCIATED INCREASE IN ALTERNATIVE ENERGY USAGE. IT WAS INEVITABLE, THEREFORE, THAT THE ECONOMY SLOWED, AND THIS IS ALSO SHOWN IN FIGURE 2.

WHILST THE UNITED STATES POSSESSED QUITE AMPLE TECHNOLOGY AND THE RESOURCES TO DEVELOP ALTERNATIVE ENERGY SOURCES, THE AVAILABILITY OF LOW-COST, REGULATED, LIQUID AND GASEOUS HYDROCARBONS FORCED U.S. INDUSTRY TO CONTINUE ITS DEVELOPMENT AS AN OIL-BASED ECONOMY AND CREATED A DEMAND IN EXCESS OF THAT EXTANT ANYWHERE ELSE IN THE WORLD. DURING THE FIVE OR SIX YEARS PRIOR TO THE ARAB OIL EMBARGO, THE RATE OF INCREASE IN GNP PER UNIT OF

ENERGY CONSUMED NOTICEABLY DECLINED, AN INDICATION OF PROFLIGACY WITH A RESOURCE WHOSE WORTH WAS ARTIFICIALLY DEVALUED. SINCE THE 1973-1974 CRISIS, FUEL EFFICIENCY HAS IMPROVED IN THE UNITED STATES BUT STILL HAS A LONG WAY TO GO BEFORE IT MATCHES THAT OF THE REST OF THE WESTERN WORLD.

DURING THE FIVE-YEAR PERIOD FROM 1972, THE UNITED NATIONS HAS BEEN FOLLOWING THE ENERGY PERFORMANCE OF THE NATIONS OF THE WORLD AND HAS CORRELATED GNP GROWTH WITH ENERGY-CONSUMPTION GROWTH OVER THE FIVE YEARS. THE RESULTS ARE SHOWN AT FIGURE 3 AND INDICATE THAT THE UNITED STATES IS CLEARLY CAPABLE OF GENERATING AN IMPROVING STANDARD OF LIVING WITHOUT THE ADVANTAGES OF CHEAP ENERGY.

THERE IS A BELIEF WITHIN THE UNITED STATES THAT ADVANCED TECHNOLOGY SHOULD BE ABLE TO BREAK THE NATIONAL DEPENDENCE OF GNP GROWTH UPON GREATER-THAN-AVERAGE ENERGY CONSUMPTION. IN 1974, THE ADMINISTRATION DECIDED TO UTILIZE PROJECTIONS OF GNP AND ENERGY USAGE WHICH WERE BASED ON A NEW AND SIGNIFICANTLY HIGHER ELASTICITY OF GNP GROWTH WITH ENERGY CONSUMPTION, THE RELATIONSHIP BEING MORE IN LINE WITH THAT ACHIEVED BY OTHER WESTERN NATIONS. FIGURE 4 SHOWS THE PREDICTIONS WHICH WERE USED AS GUIDELINES AND ALSO INCLUDES THE FIRST FOUR YEARS' RESULTS. IT IS APPARENT THAT, IN THE NEAR TERM, THERE IS SOME INDICATION OF IMPROVEMENT, AND IN THESE CIRCUMSTANCES IT HAS TO BE ASSUMED THAT ANY COMPULSORY REDUCTION IN ENERGY USAGE MAY NOT NECESSARILY BE ASSOCIATED WITH A DECAY IN THE RATE OF GROWTH OF THE ECONOMY IF RIGID ECONOMIC DISCIPLINES ARE APPLIED.

FACED WITH A PROGRESSIVELY WORSENING OIL SITUATION, THE UNITED STATES HAS SPENT SOME TIME IN REVIEWING ALTERNATIVE ENERGY SOURCES, BUT ENVIRONMENTAL AND ECONOMIC PRESSURES HAVE SUCCESSFULLY BLOCKED THEIR DEVELOPMENT. HAVING RECOGNIZED THAT ALL ALTERNATIVES POSSESS NEGATIVE AS WELL AS POSITIVE EFFECTS ON SOCIETY AND WILL BE COSTLY, THE ADMINISTRATION HAS FINALLY ACTED AND DECIDED TO DEREGULATE THE PRICE OF ALL OIL BY 1981. THE PRICE RISE FOR FINISHED PRODUCTS WHICH WILL ACCOMPANY THIS CHANGE WILL, IT IS HOPED, STIMULATE DOMESTIC PRODUCTION AND REDUCE THE DEPENDENCE ON IMPORTED OIL. THE RESULT OF THE POLICY, THEREFORE, IS LIKELY TO BE THAT SERIOUS OIL SHORTAGES WILL NOT OCCUR, BUT THAT PRICES WILL INCREASE SUBSTANTIALLY, FOR BOTH AUTOMOBILE GASOLINE AND AVIATION KEROSENE.

THE ECONOMIC EFFECTS ON AIR TRAVEL DEMAND

A SUBSTANTIAL INCREASE IN PRICES FOR OIL PRODUCTS CAN AFFECT THE DEMAND FOR AIR TRAVEL IN A VARIETY OF WAYS. AMONGST THE VARIABLES WHICH HAVE BEEN ANALYZED AS AFFECTING DEMAND ELASTICITY HAVE BEEN THE GROSS NATIONAL PRODUCT, DISPOSABLE INCOME OR DISCRETIONARY SPENDING, THE FARE STRUCTURE, AND, ALSO, THE COSTS OF GASOLINE AND GROUND-TRANSPORTATION CHARGES.

A SOPHISTICATED APPROACH TO ASSESSING AIR TRANSPORTATION WOULD INVOLVE AN ANALYSIS OF ALL THE FACTORS AND THEIR RELATIVE INTERACTION, BUT HISTORICALLY ROLLS-ROYCE HAS ADOPTED A MORE SIMPLIFIED STUDY. AT FIGURE 5, THE RELATIVITY OF GROSS NATIONAL

PRODUCT AND TOTAL TRAFFIC GROWTH IS SHOWN IN GRAPHICAL FORM. WHILST UNDOUBTEDLY THERE HAS BEEN AN HISTORIC RELATIONSHIP BETWEEN THE TWO, IT IS DIFFICULT TO QUANTIFY OTHER THAN IN THREE-YEAR-AVERAGE TERMS. BECAUSE PLEASURE AND NON-BUSINESS TRAVEL HAS BECOME AN INCREASINGLY LARGE PART OF THE TOTAL TRANSPORT SCENE DURING THE PAST FEW YEARS, THE PURITY OF THE ANALYSIS IS DISTORTED BY FACTORS WHICH DO NOT IMPINGE DIRECTLY ON BUSINESS TRAVEL ALONE. THERE IS, HOWEVER, A QUITE CLEAR TREND IN CHANGING DEMAND ELASTICITY: AS THE FIGURE SHOWS, IN 1950, A 1-PERCENT INCREASE IN GNP GENERATED A 6-PERCENT INCREASE IN AIR TRAVEL; BY 1980, THE MULTIPLIER WILL BE DOWN TO 1.5 AND WILL CONTINUE TO REDUCE AS THE CENTURY DRAWS TO A CLOSE AND THE AIRLINE INDUSTRY APPROACHES MATURITY.

AT THE SAME TIME, A SHORT-TERM REVIEW OF THE GROWTH OF REAL GNP INDICATES THAT AN AREA OF STAGNATION IS ABOUT TO OCCUR IN THE UNITED STATES (FIGURE 6); WHILST ITS CHARACTERISTIC MAY BE A MAJOR RECESSIONARY CYCLE FOLLOWED BY A SHARP UPTURN, GROWTH BEYOND 2 TO 3 PERCENT PER ANNUM IS UNLIKELY TO RETURN, AND IT MAY BE CONCLUDED, THEREFORE, THAT BUSINESS TRAVELERS, WHO TEND TO BE INSENSITIVE TO FARE CHANGES, WILL BE A REDUCING PERCENTAGE OF THE GROWTH IN AIR TRAVEL.

DISCRETIONARY SPENDING IS DIFFERENT: THE NON-BUSINESS TRAVELER IS FARE-SENSITIVE TO QUITE AN EXTENT, AND SUCH TRAVEL IS HIGHLY DEPENDENT UPON THE PER-CAPITA DISPOSABLE INCOME. AT FIGURE 7 IS A CHART DEPICTING THE CHANGE IN NON-BUSINESS TRAVEL

PLOTTED AGAINST PER-CAPITA DISPOSABLE INCOME IN REAL-MONEY TERMS. IT CAN BE SEEN THAT THERE IS A CLOSE CORRELATION IN THE RESULTS, BUT THE CONTINUATION OF THIS GROWTH HAS TO BE ASSOCIATED WITH THE AIRLINES' ABILITY TO OFFER FARES WHICH DO NOT RISE AS QUICKLY AS OTHER CONSUMER PRICES. IN FACT, AS FIGURE 8 SHOWS, THE HISTORICAL AVERAGE PROMOTIONAL FARE CHARGED BY THE U.S. TRUNKS HAS DROPPED IN REAL-MONEY TERMS DURING THE PAST FIVE YEARS, AND CONTINUING GROWTH OF THIS TRAFFIC WILL DEPEND UPON SIMILAR RELATIONSHIPS.

THE DOMESTIC UPSURGE IN AIR-TRAFFIC GROWTH DURING THE PAST FEW YEARS HAS PROBABLY ALSO BEEN ASSOCIATED WITH THE COMPARISON WITH GROUND TRANSPORTATION AND, AS GASOLINE PRICES HAVE INCREASED, THE ATTRACTION OF AIR TRAVEL AT BARGAIN PRICES HAS ALSO INCREASED. FIGURE 9 SHOWS THE ESCALATING SHARE OF DISPOSABLE INCOME WHICH IS REPRESENTED BY GASOLINE, AND THE INEVITABLE PRICE INCREASES DURING THE NEXT TWO YEARS WILL HELP TO CONTINUE THE TRANSFER OF PASSENGERS FROM THE ROADS TO THE AIRLINES. THE PHENOMENON OF TRANSFER FROM SURFACE TO AIR TRAVEL IS NOT NEW: THE MORE ECONOMICAL AIRCRAFT ENSURED THE DEMISE OF THE LONG-DISTANCE RAILROAD PASSENGER IN THE 1940's. SADDLED, AS THEY WERE, WITH ENORMOUS CAPITAL NEEDS AND AN EVER-INCREASING MAINTENANCE BURDEN, THE RAILROADS' OPERATING COSTS WERE SIGNIFICANTLY HIGHER THAN THOSE OF THE AIRLINES. AT THE SAME TIME, THE AIRLINES OFFERED AN INTRINSICALLY MORE ATTRACTIVE, CONVENIENT MODE OF TRAVEL AND, IN AN ATTEMPT TO DEFEND ITS MARKET SHARE, THE RAILROAD INDUSTRY PROLIFERATED LOW FARES BASED ON MARGINAL COSTING, WITH THE INEVITABLE RESULT: IF IT IS TO REMAIN IN SERVICE, ANY TRANSPORTATION SYSTEM MUST BE CAPABLE OF SERVICING ITS OWN CAPITAL NEEDS.

IN THE SHORTER-HAUL BUSINESS, THE AUTOMOBILE HAS REMAINED MARGINALLY COMPETITIVE FOR A TWO-OR-MORE-PERSON PARTY, BUT, AS GASOLINE BECOMES MORE EXPENSIVE, IF THE AIRLINE INDUSTRY CAN MAINTAIN ITS TRADITIONAL ADVANTAGES, MORE PEOPLE WILL TRAVEL BY AIR, EVEN FOR THE MODEST LENGTH OF TRIP. A GOOD INDICATION OF THIS TREND CAN BE SEEN AT FIGURE 10, WHICH COMPARES THE GROWTH RATES IN PASSENGER TRAFFIC ACHIEVED BY BOTH U.S. TRUNK CARRIERS AND THE LOCAL SERVICE OPERATORS. IT CAN BE SEEN THAT TRAFFIC IS BOOMING IN THE SHORTER-HAUL LOCAL MARKETS, ALMOST CERTAINLY AN INDICATION THAT THE TRAVELER IS BEING WOODED AWAY FROM THE AUTOMOBILE, AND IT CAN BE ASSUMED THAT SIMILAR GROWTH EXISTS IN THE SHORTER-HAUL SECTORS FLOWN BY THE TRUNK CARRIERS.

THE AVERAGE STAGE LENGTH FLOWN BY THE LOCAL-SERVICE CARRIERS AND THE TRUNK AIRLINES IS SHOWN IN FIGURE 11. IT WILL BE SEEN THAT, ONCE HIGH-CAPACITY AIRCRAFT BECAME AVAILABLE TO CATER FOR THE LONGER-HAUL SECTORS, WHICH ARE LESS FREQUENCY-CONSCIOUS, THERE WAS A DRAMATIC CHANGE IN THE RATE OF INCREASE IN THE AVERAGE LENGTH FOR THE TRUNK CARRIERS. INCREASING FREQUENCY DEMANDS ON THE SHORTER-HAUL SECTORS HAVE ALSO CONTRIBUTED TO STABILIZATION OF THE OVERALL AVERAGE STAGE LENGTH. SECTOR LENGTHS CONTINUE TO INCREASE IN THE LOCAL-SERVICE CARRIERS, GENERALLY ASSOCIATED WITH AMBITIOUS EXPANSION AND PROLIFERATING CITY-PAIR CONNECTIONS. IT IS ANTICIPATED THAT THESE WILL DISPLAY A SIMILAR LEVELING TREND TO THAT OF THE TRUNK CARRIERS ONCE THE FREQUENCY DEMANDS ARE FILLED AND THE AIRCRAFT SIZES HAVE TO START INCREASING EVEN IN THE LOCAL-SERVICE MARKETS.

INCREASES IN FUEL PRICES AFFECT THE NON-BUSINESS TRAVELER, THEREFORE, IN A VARIETY OF WAYS:-

A. UNLESS THE AIRLINE CAN OFFER A SEAT AT A PRICE WHICH IS INFLATING NO FASTER THAN THE REST OF THE ECONOMY, DISCRETIONARY AIR TRAVEL WOULD SLOW IN ITS GROWTH.

B. DISCRETIONARY TRAVEL IS HIGHLY SENSITIVE TO DISPOSABLE INCOME. IF INCREASING ENERGY CHARGES OF ALL TYPES RESULT IN A REDUCTION IN PER-CAPITA DISPOSABLE INCOME, THEN NON-BUSINESS AIR TRAVEL WOULD TEND TO DECLINE. THE RECENT HISTORY OF DISPOSABLE INCOME IS SHOWN AT FIGURE 12 AND CLEARLY DEMONSTRATES THAT THE ARTIFICIAL STIMULATION OF GROWTH BY LOW FARES WAS NOT JUSTIFIED BY THE DISPOSABLE-INCOME STORY AND MUST BE VIEWED AS HAVING BEEN UNHEALTHY.

C. INCREASING GASOLINE CHARGES AND THEIR EFFECT ON OTHER ITEMS IN THE OVERALL TRAVEL PACKAGE WILL INCREASE THE DEMAND FOR DISCRETIONARY AIR TRAVEL AT THE EXPENSE OF ROAD TRANSPORT, POSSIBLY QUITE DRAMATICALLY IN THE SHORT-HAUL MARKETS.

IT IS ANTICIPATED THAT BUSINESS TRAVEL WILL CONTINUE IN ITS TRADITIONAL MANNER, INCREASING DURING THE NEXT FEW YEARS AT A RATE OF ABOUT 1.5 TIMES THE RATE OF INCREASE IN GNP. WHILST THIS GROWTH IS RELATIVELY INSENSITIVE TO FARE CHANGE, TO BE CERTAIN OF CONTINUING GROWTH IN THIS HIGH-YIELD MARKET, THE AIRLINES WILL BE CALLED UPON TO DISPLAY NO VIOLENT PERTURBATIONS FROM EXISTING FARE TRENDS.

AS IT IS, GROWTH IN 1980 FARES HAS BEEN AT A GREATER RATE THAN THE COST OF LIVING, AND THE INEVITABLE DOWNTURN HAS OCCURRED. GROWTH IN BUSINESS TRAVEL WILL TEND TO BE SLOWER IN THE LONG-RANGE

MARKETS, WHILST THE SHORT-HAUL BUSINESS SECTOR WILL BENEFIT FROM EXACTLY THE SAME STIMULUS AS THE SHORT-HAUL NON-BUSINESS TRAFFIC. THIS STIMULATION WILL EXIST NOT ONLY IN THE COMMUTER AND LOCAL-SERVICE MARKETS BUT ALSO IN THE SHORTER-HAUL SEGMENTS OF THE TRUNK CARRIERS IF THEY CAN CONTINUE TO OFFER ECONOMIC FARES AND REASONABLE FUEL EFFICIENCY. THE TYPES OF AIRCRAFT WHICH CAN OFFER THIS TYPE OF SERVICE ARE, THEREFORE, THOSE INTO WHICH THE LOCAL-SERVICE CARRIERS COULD GROW DURING THE NEXT FEW YEARS; THEY WILL ALSO HAVE WIDESPREAD APPEAL IN THE SHORTER-HAUL, HIGH-FREQUENCY SECTIONS OF THE TRUNK CARRIERS.

AIRLINE EQUIPMENT PROGRAMS.

THREE FUNDAMENTAL AIRCRAFT FACTORS AFFECT AIRLINE EFFICIENCY IN FUEL TERMS: AIRPLANE SIZE, AIRFRAME DESIGN, AND ENGINE EFFICIENCY. OTHER FACTORS ALSO AFFECT THE RESULTS: PILOT TRAINING AND EXPERIENCE, AIR-TRAFFIC CONTROL, AND THE GENERAL STATE OF NAVIGATIONAL CAPABILITY WITHIN THE AIRLINE NETWORK. FIGURE 13 SHOWS THE OVERALL ENERGY CONSUMPTION OF THE AIRLINE INDUSTRY FOR THE PAST THIRTY YEARS. THE INTRODUCTION OF THE TURBINE ENGINE SAW A 55-PERCENT INCREASE IN THE AMOUNT OF ENERGY CONSUMED TO GENERATE A SEAT MILE, A FACTOR COMPOUNDED OF EARLY TURBINE INEFFICIENCY AND INEXPERIENCED FLIGHT CREWS AND AIR-TRAFFIC-CONTROL SYSTEMS. DURING THE PAST TEN YEARS, THINGS HAVE STEADILY IMPROVED UNTIL, THIS YEAR, THE INDUSTRY SHOULD BE BACK TO THE FUEL EFFICIENCIES IT ENJOYED 25 YEARS AGO.

THE INDIVIDUAL AIRLINE CHANGES IN FUEL EFFICIENCIES ARE SHOWN AS RAW DATA AT FIGURES 14 THROUGH 17, AND CORRECTED TO A STANDARD STAGE LENGTH OF 500 NM AT FIGURES 18 THROUGH 21. IT WILL BE SEEN THAT THERE EXISTS A STEADY, SLOW IMPROVEMENT IN FUEL EFFICIENCY FOR ALL OF THE CARRIERS, WHILST THE CARRIERS OPERATING LARGER AIRCRAFT ON LONGER-HAUL SECTORS TEND TO USE THE LEAST FUEL PER TON-MILE. IT WILL REQUIRE A CONSIDERABLE RE-EQUIPMENT PROGRAM TO DISPLAY IMPROVEMENT IN THIS SCENE UNLESS THE LESS FUEL EFFICIENT, EARLY JT8-POWERED AIRCRAFT ARE REPLACED.

FIGURE 22 SHOWS THE FUEL USAGE BY AIRCRAFT TYPE FOR ALL THE VARIOUS TYPES OF AIRCRAFT IN OPERATION WITHIN THE UNITED STATES DURING THE PAST TWELVE YEARS OR SO. THE GENERAL TREND ON ALL TYPES OF AIRCRAFT IS TOWARDS BETTER FUEL EFFICIENCY AS EXPERIENCE GROWS, AND, WITHIN A GIVEN TECHNOLOGY ENVELOPE, SMALLER AIRCRAFT TEND TO USE MORE FUEL PER TON-MILE THAN DO LARGER AIRCRAFT. IN MAKING AN ASSAULT ON FUEL-COST REDUCTIONS, THE AIRLINES HAVE ALREADY TAKEN THE SIMPLE STEPS OF INTRODUCING LARGER, MORE EFFICIENT AIRCRAFT ON THE MEDIUM- TO LONG-HAUL OPERATIONS WHICH ARE COMPARATIVELY FREQUENCY-INSENSITIVE. THE REAL TASK FOR THE FUTURE IS TO IMPROVE THE FUEL EFFICIENCY OF THE SMALLER AIRCRAFT USED IN THE SHORT- TO MEDIUM-RANGE SERVICES WHICH TEND TO BE HIGHLY FREQUENCY-SENSITIVE.

THE CHART ALSO DEMONSTRATES THE DIFFERENCE WHICH EXISTS IN TERMS OF FUEL EFFICIENCY BETWEEN THOSE AIRCRAFT WHICH UTILIZE HIGH-BYPASS-RATIO ENGINES AND THOSE WHICH DO NOT. IN THE INTERESTS OF CLARITY AND COMPLETENESS, THE PREDICTIONS FOR THE B767 AND

AND B757, TWO NEW BOEING DESIGNS, ARE PLOTTED AS SPOT POINTS TO THE RIGHT OF THE CHART. IT CAN BE SEEN THAT, ON A 500-MILE AVERAGE SECTOR, THE B767 DISPLAYS SIMILAR FUEL EFFICIENCY TO THAT OF THE OTHER MODERN WIDE-BODIED TWIN JETS, WHILST THE B757 DISPLAYS EVEN BETTER FUEL EFFICIENCY, A UNIQUE QUALITY IN A SMALLER AIRCRAFT: AS A 165- TO 175-SEAT AIRCRAFT, IT POSSESSES THE FUEL EFFICIENCY OF AN AIRCRAFT ABOUT TWICE ITS SIZE AND DEMONSTRATES THE IMPROVED FUEL EFFICIENCY OF THE STANDARD FUSELAGE WIDTH WHEN COMBINED WITH THE ECONOMY OF A HIGH-BYPASS-RATIO ENGINE AND A MODERN WING DESIGN.

WHEN THE FIRST HIGH-BYPASS-RATIO ENGINES WERE MADE AVAILABLE, THEY COULD BE USED ONLY IN VERY LARGE AIRFRAMES WHICH POSSESSED LIMITED APPLICABILITY IN THE U.S. AIRLINE INDUSTRY; THEIR USE WAS EXPANDED WHEN THE TRIJETS WERE INTRODUCED AND WILL BE EVEN FURTHER EXPANDED AS THE SMALLER, WIDE-BODIED TWIN-JET AIRCRAFT BECOME AVAILABLE IN SIGNIFICANT QUANTITIES. FIGURE 23 SHOWS THE HISTORICAL INCREASE IN TON-MILES GENERATED BY U.S. TRUNK AIRCRAFT EQUIPPED WITH HIGH-BYPASS-RATIO ENGINES. AFTER AN INITIALLY HIGH INTRODUCTION RATE, THE PAST FIVE OR SIX YEARS HAVE BEEN SYMBOLIZED BY STAGNATION CAUSED BY AN INABILITY TO OFFER THE ADVANTAGES OF FUEL EFFICIENCY WITHOUT LOSING THE COMMERCIAL NEED FOR HIGH-FREQUENCY OPERATION ON SHORT-TO-MEDIUM-HAUL FLIGHTS.

AIRCRAFT SIZES

THERE IS A BOTTOM LIMIT TO THE SIZES OF AIRCRAFT WHICH CAN BE OFFERED WITH THE SALES ADVANTAGES OF TWIN-AISLES. THE KNOWN

OUTSIDE LIMITS FOR ALL FUSELAGE CROSS-SECTIONS ARE SHOWN AT FIGURE 24. ONLY A SINGLE-AISLE AIRCRAFT CAN OFFER THE MODERATE SEATING CAPACITIES ESSENTIAL IF THE ADVANTAGES OF FUEL EFFICIENCY AND MODERN DESIGN ARE TO BE BROUGHT TO THE SHORT-HAUL OPERATIONS, WHERE HIGH FREQUENCY IS A BETTER SELLING POINT THAN TWIN-AISLE SPACIOUSNESS. THE BOEING B757 IS THE ONLY AIRCRAFT CURRENTLY ON OFFER WHICH COMBINES THE SINGLE-AISLE ECONOMY WITH THE PROVEN BENEFITS OF MODERN ENGINE TECHNOLOGY; IF ITS LAUNCHED SIZE IS RIGHT, IT IS LIKELY TO HAVE AN EXTENDED AND HIGHLY SUCCESSFUL LIFE.

THROUGHOUT THE HISTORY OF THE AIRLINE INDUSTRY, THE AVERAGE SIZE OF AIRLINE VEHICLES HAS INCREASED. FIGURE 25 SHOWS THE HISTORIC TREND IN THE U.S. TRUNKLINE INDUSTRY. IN SPITE OF THE GEOMETRIC INCREASE IN SCHEDULED AIR TRAFFIC, IT IS WORTHY OF NOTE THAT THE INCREASE IN AVERAGE SEATING CAPACITY HAS BEEN LINEAR IN CHARACTER, ADDING ONLY ABOUT FOUR ADDITIONAL SEATS PER AIRCRAFT IN EACH YEAR, WHILST THE REST OF THE GROWTH WAS ABSORBED BY INCREASING FREQUENCY ON THE SHORTER-HAUL SECTORS. THE CHARACTERISTICS AND CAPABILITIES OF THE INDIVIDUAL FLEETS DIFFER DRAMATICALLY, AND, TO OBTAIN AN IDEA OF HOW U.S. TRUNK AIRLINES DEPLOY VARIOUS SIZES OF AIRCRAFT, AN ANALYSIS OF MEAN STAGE LENGTH OF EACH AIRCRAFT TYPE IN EACH FLEET WAS CONDUCTED FOR THE YEARS 1968 AND 1977. THE LINEAR-REGRESSION RESULTS ARE SHOWN IN FIGURE 26, AND THE RESULTS ARE OF STATISTICAL SIGNIFICANCE. IT WILL BE SEEN THAT THE AVERAGE SIZE OF AIRCRAFT DEPLOYED ON SHORTER-HAUL SECTORS APPARENTLY INCREASED AT A SLOWER RATE THAN WAS THE CASE

FOR THE MEDIUM-TO-LONG-HAUL SECTORS WHICH COULD ACCEPT THE LOW-FREQUENCY SERVICE OF THE LARGE, TWIN-AISLE AIRCRAFT WHICH WERE INTRODUCED BETWEEN THE TWO YEARS IN QUESTION. TO CONFIRM THIS APPARENT RESULT, A SIMILAR ANALYSIS WAS CONDUCTED AT TWO-YEAR INTERVALS FROM 1966 TO 1976. THE RESULTS ARE SHOWN IN FIGURE 27, TOGETHER WITH THE PREDICTIONS FOR THE YEARS 1982 AND 1984. DURING THE PERIODS IN WHICH NO EXCESSIVELY LARGE-CAPACITY AIRCRAFT WERE INTRODUCED, 1966 TO 1968 TO 1970, GROWTH IN AIRCRAFT SIZE FOR A GIVEN AVERAGE RANGE CHANGED LITTLE, THE EXISTING AIRCRAFT GENERALLY BEING DEPLOYED ON SUCCESSIVELY SHORTER SECTORS. DURING THE PERIOD WHEN LARGE-CAPACITY AIRCRAFT WERE INTRODUCED (BETWEEN 1970 AND 1974), THEIR APPLICATION TO THE LONGER SECTORS CAUSED A SIGNIFICANT CHANGE IN THE SIZE OF AIRCRAFT OPERATING THOSE SECTORS AND RESULTED IN A MAJOR CHANGE IN THE RELATIONSHIP BETWEEN AIRCRAFT SIZES AND THE RANGES UPON WHICH THEY ARE DEPLOYED. AFTER 1974, THE TREND WHICH EXISTED IN THE 60'S APPEARS TO HAVE BEEN RE-ESTABLISHED, AND IT IS ANTICIPATED THAT IT WILL REMAIN SO UNTIL 1982 WHEN THE NEW GENERATION OF 200-SEAT WIDE-BODIED AIRCRAFT WILL BE INITIATED. IT MAY ALSO BE ASSUMED THAT A SIMILAR ACCELERATION OF SIZE GROWTH IN THE MEDIUM-RANGE MARKETS WILL OCCUR DURING THE PERIOD OF INTRODUCTION OF THESE NEW AIRCRAFT BETWEEN 1982 AND 1984. AFTER THAT PERIOD, IT IS TO BE EXPECTED THAT THE TREND WILL REVERT TO THE MORE GRADUAL REDUCTION IN THE AVERAGE RANGE FLOWN BY EACH TYPE OF AIRCRAFT. USING THE ABOVE ASSUMPTION AS A SIMPLE PREDICTION TECHNIQUE, IT IS TO BE ANTICIPATED THAT

THE ARRIVAL OF THE B757 ON THE AIRLINE SCENE IN 1983 WILL RESULT IN ITS OPERATING IN A MANNER, AND ON ROUTES, SIMILAR TO THE B727-100 WHEN IT ARRIVED IN 1967, OR THE B727-200 WHICH ARRIVED IN 1972.

TO ASSIST IN AN UNDERSTANDING OF TRAFFIC DEVELOPMENT AND AIRCRAFT SIZING, AN ANALYSIS OF AIRLINE TRAFFIC WAS MADE IN VARIOUS RANGE BRACKETS AND THE RESULTS ARE SHOWN IN FIGURE 28. IT CAN BE QUITE CLEARLY SEEN THAT THOSE LONGER-RANGE SECTORS, UPON WHICH FREQUENCY WAS NOT NECESSARILY A COMPETITIVE FACTOR, RAPIDLY CHANGED TO THE LARGER, WIDE-BODIED AIRCRAFT. THE SHORTER-RANGE ROUTES RETAINED AN ARTIFICIALLY LOW RATE OF SIZE GROWTH FOR TWO REASONS: FIRSTLY, THERE WAS NO SENSIBLY SIZED AND ECONOMICAL AIRCRAFT BETWEEN THE B727-200 AND THE AIRBUS/TRIJETS, AND, SECONDLY, ON THE SHORT-HAUL ROUTES, THE AIRLINES FOUND FREQUENCY TO BE A POWERFUL COMPETITIVE TOOL. LITTLE MONEY HAS BEEN SPENT ON AIRPORT IMPROVEMENT OR AIR-TRAFFIC CONTROL DURING THE RECENT PAST, AND THE CONTINUING INCREASE IN SHORT-HAUL FREQUENCIES WILL HAVE TO STOP BECAUSE PHYSICAL CONSTRAINTS WILL STOP IT. AT THAT POINT, AND IT IS NOT FAR REMOVED, GROWTH WILL HAVE TO BE ABSORBED BY UNIT SIZE ALONE AND AVERAGE AIRCRAFT SIZES WILL START A RAPID INCREASE.

AIRLINE YIELDS AND COSTS

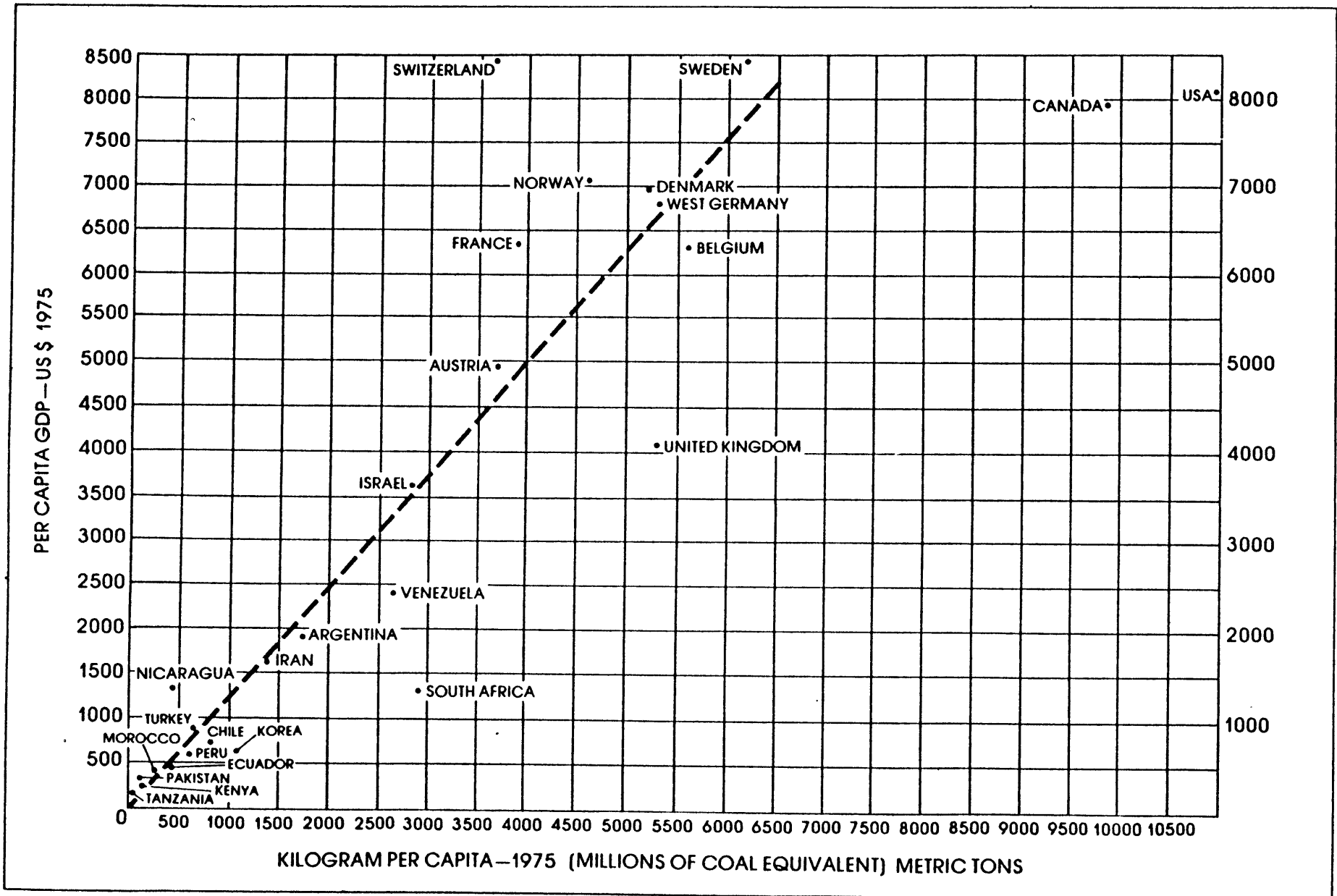
WHILST AIRLINE YIELDS HAVE DISPLAYED A STEADY INCREASE IN NUMERICAL VALUES SINCE THE LATE 1960'S, THE REAL-MONEY TRUNK-AIRLINE YIELD HAS DECLINED DURING EVERY YEAR BUT ONE SINCE 1962. THIS YEAR IS LIKELY TO BE ANOTHER. WHILST THE LOCAL-SERVICE-

CARRIER RESULTS ARE SOMEWHAT BETTER, EVEN HERE, THE REAL-MONEY YIELDS ARE LOWER NOW THAN IN THE EARLY 1960's. AN ANALYSIS OF THE ELASTICITY OF DEMAND FOR NON-BUSINESS TRAVEL WITH REDUCING YIELD HAS BEEN COMPLETED AND IS SHOWN AT FIGURE 30. AS WAS TO BE EXPECTED, THE RESULTS DEMONSTRATE A HIGH DEGREE OF CORRELATION BETWEEN REDUCING YIELDS AND INCREASED TRAFFIC, A FACT WHICH IS UNDERSCORED BY 1980 RESULTS TO DATE. TO MAINTAIN THE TRADITIONAL RELATIONSHIP BETWEEN FARES AND GROWTH IN AIR TRAVEL, IT WILL BE ESSENTIAL FOR THE AIRLINES TO OFFER, IN THE SHORT-HAUL-GROWTH MARKETS, A CONTINUATION OF THE TREND TOWARDS BETTER AIRPLANE EFFICIENCY, WHICH CAN ONLY BE ACHIEVED BY USING THE LARGEST, HIGH-TECHNOLOGY AIRFRAME AND ENGINE CAPABLE OF OPERATING ON THESE FREQUENCY-SENSITIVE SHORT-TO-MEDIUM-HAUL ROUTES.

IT IS CONCLUDED, THEREFORE, THAT, WHILST AIR TRANSPORT IN THE UNITED STATES IS LIKELY TO GROW AT ABOUT THE RATE ASSUMED IN THE FIFTEEN-YEAR FORECAST, THE GROWTH IN THE SHORTER-HAUL SEGMENT OF THE MARKET WILL BE GREATER THAN HAD BEEN PREVIOUSLY EXPECTED. THIS INCREASED RATE OF GROWTH WILL BENEFIT THE LARGER LOCAL-SERVICE CARRIERS AND WILL ALSO MANIFEST ITSELF IN THE SHORTER-HAUL TRAFFIC IN THE TRUNK FLEETS.

IN THE HIGH-FUEL-COST ENVIRONMENT WHICH WILL EXIST IN THE FUTURE, FARE INCREASES CAN BE CONTAINED WITHIN LIMITS LIKELY TO GENERATE CONTINUING GROWTH ONLY IF OPERATING COSTS ARE MINIMIZED BY THE USE OF THE MOST FUEL-EFFICIENT AIRCRAFT, OF THE CORRECT SIZE, TO MATCH THE TRAFFIC DEMAND.

ENERGY VS. GNP



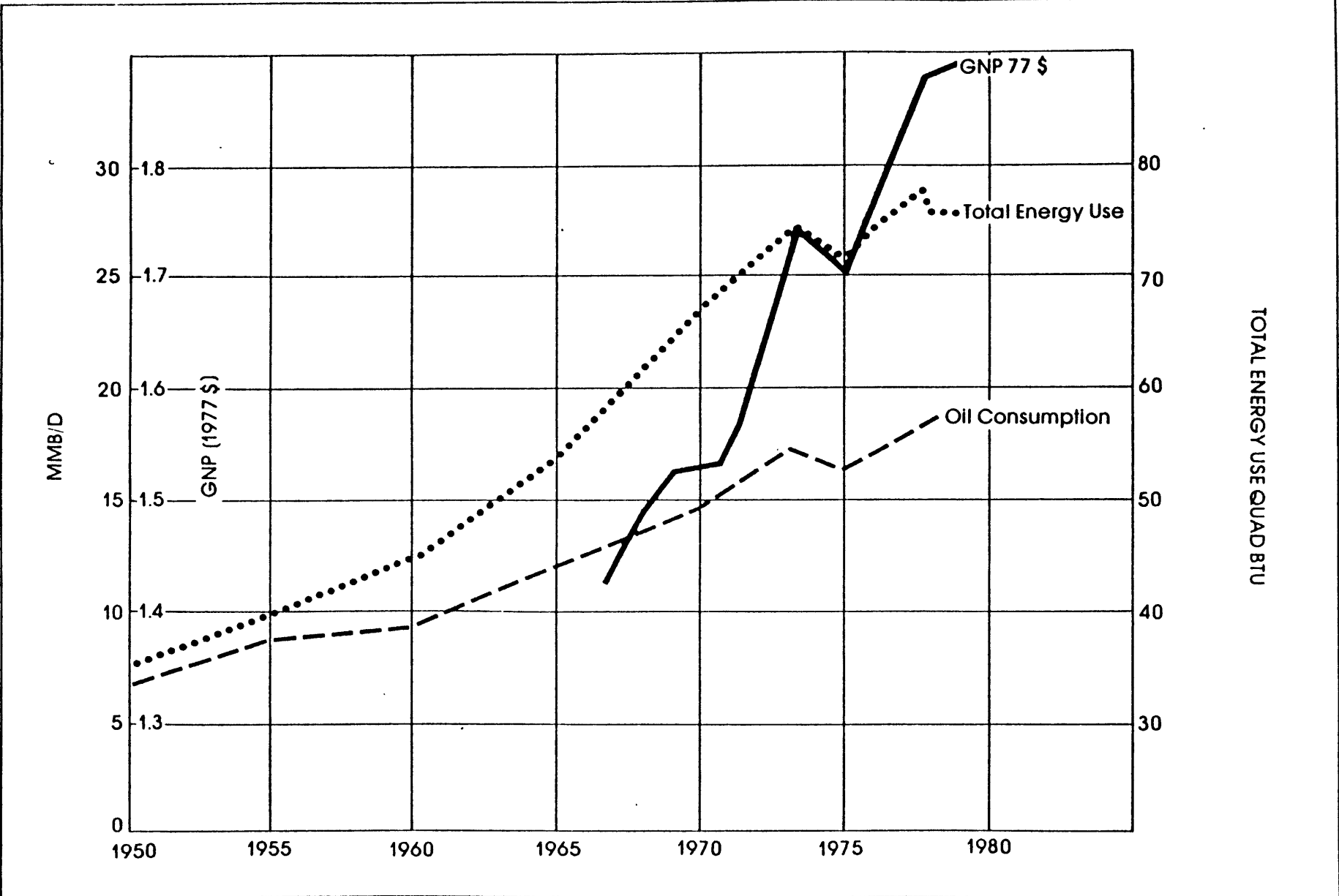
SOURCE: 1976 U.N. Statistical Yearbook



ENERGY AND AIRLINE TRAFFIC/

Fig. 1

U.S. ENERGY USAGE AND GNP



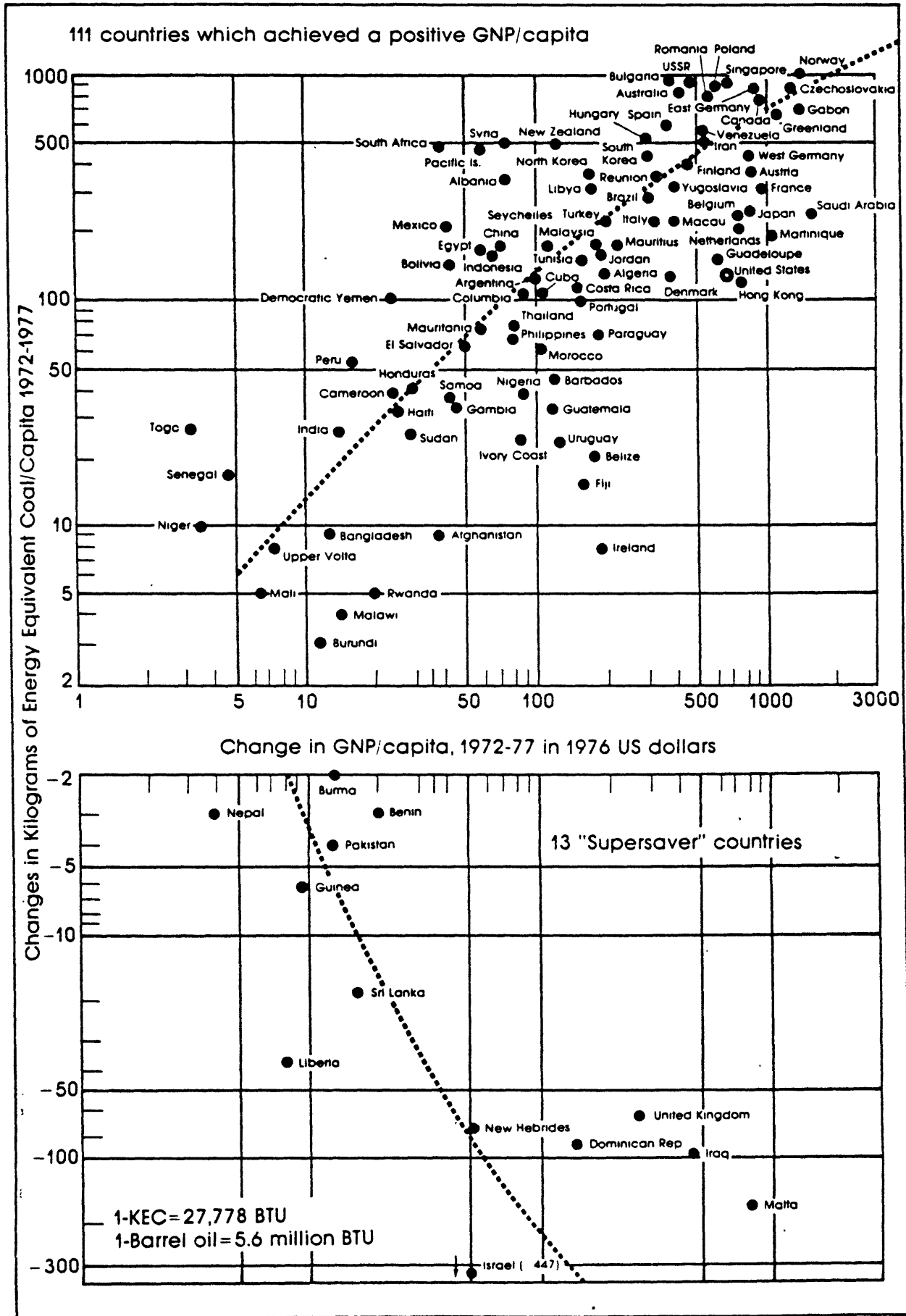
Market Planning & Analysis RRI-NY



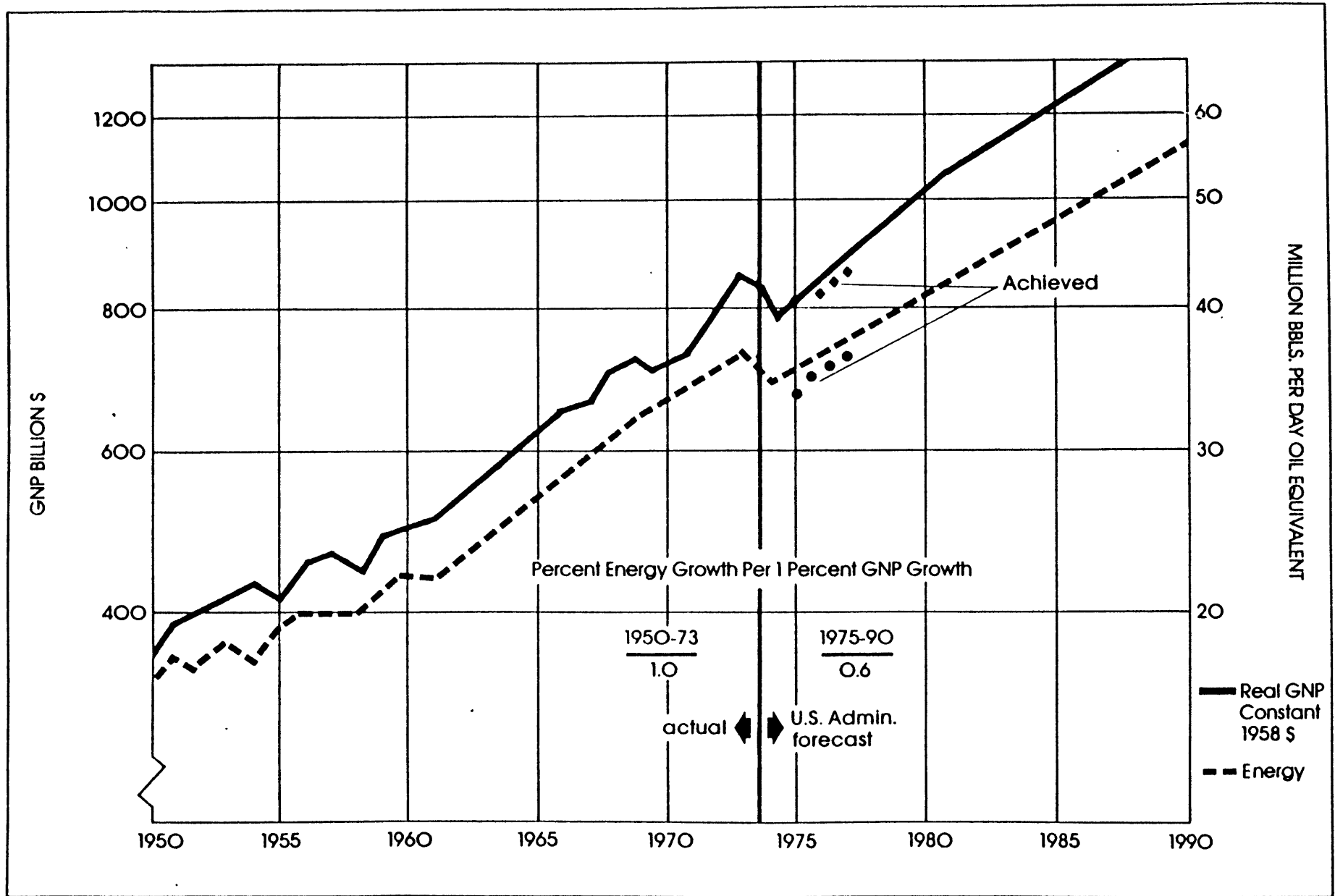
ENERGY AND AIRLINE TRAFFIC/:

Fig. 2

CHANGES IN GNP AND ENERGY PER CAPITA 1972-1977



U.S. GNP AND ENERGY PROJECTIONS



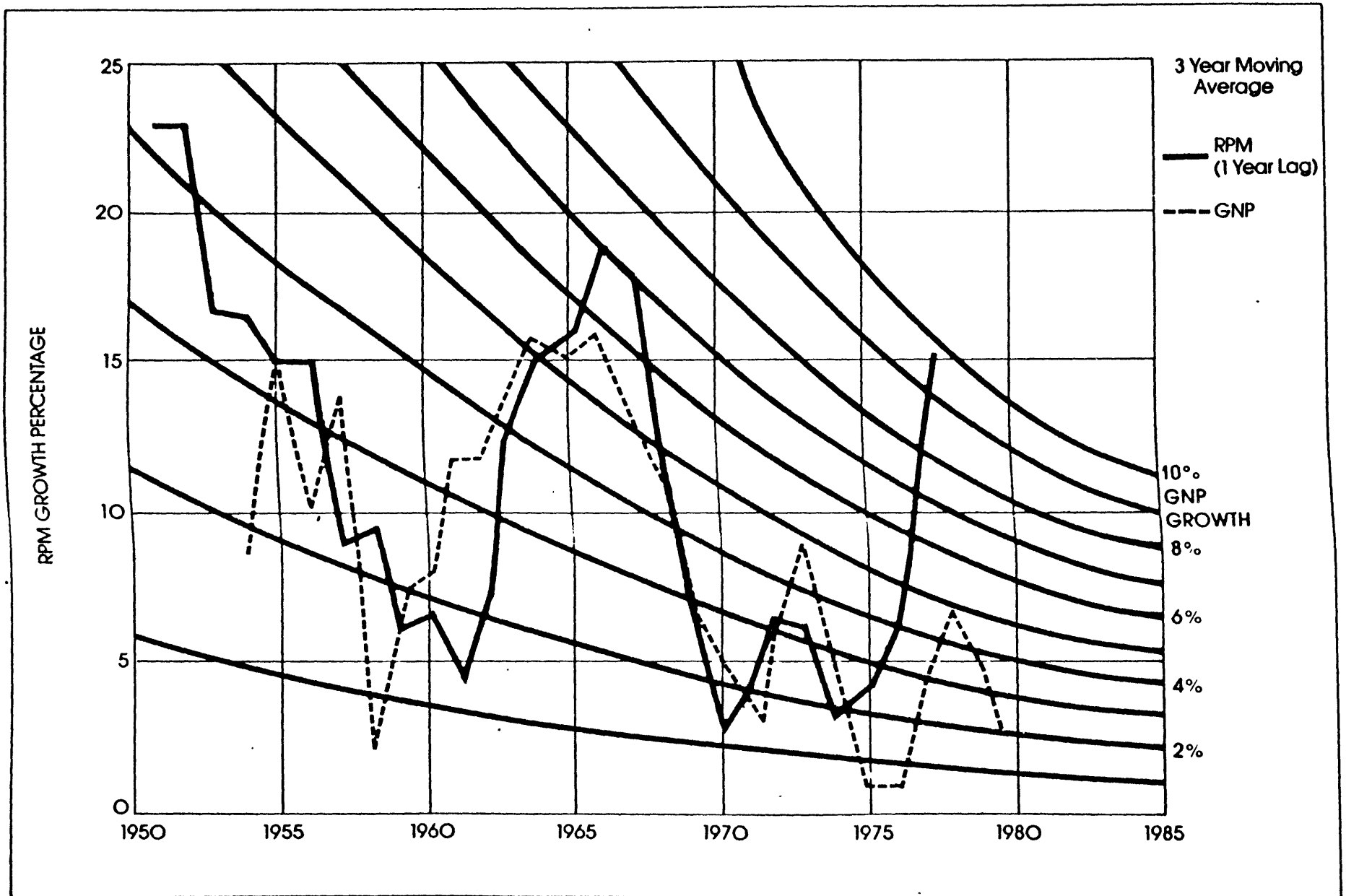
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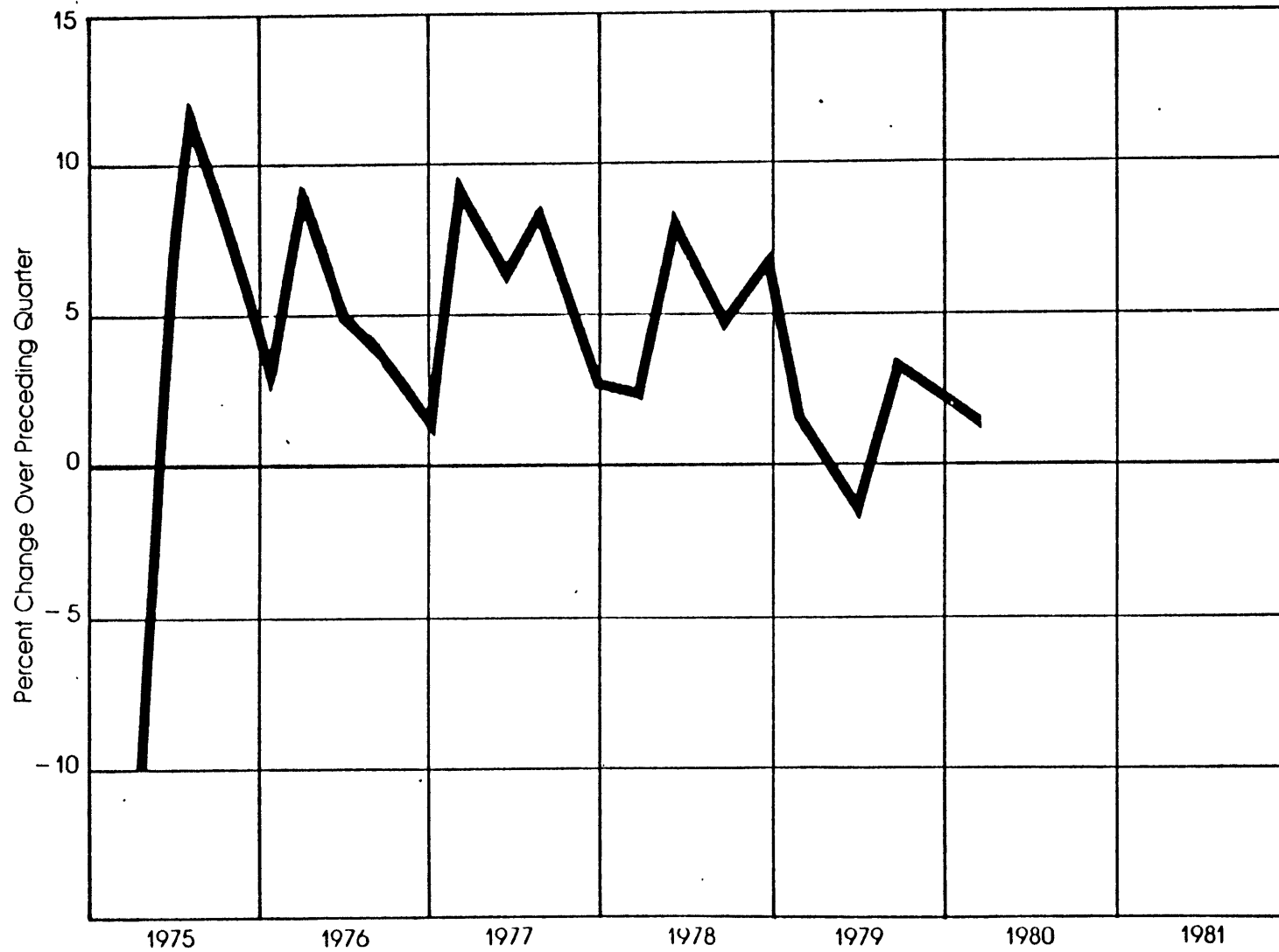
Fig. 4

TRUNK DOMESTIC SCHEDULED TRAFFIC vs. GNP



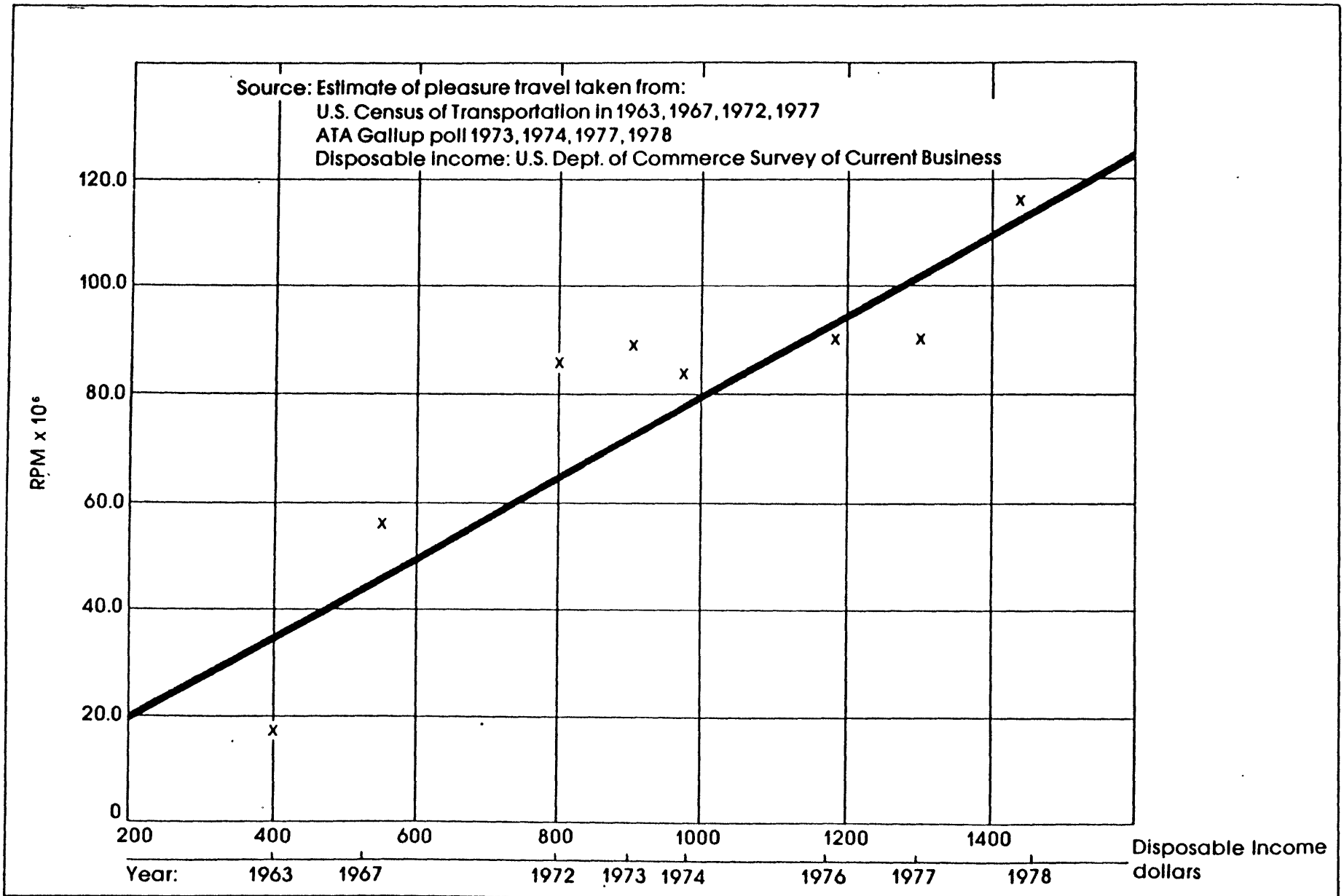
REAL GNP GROWTH RATES

Constant '72 Prices

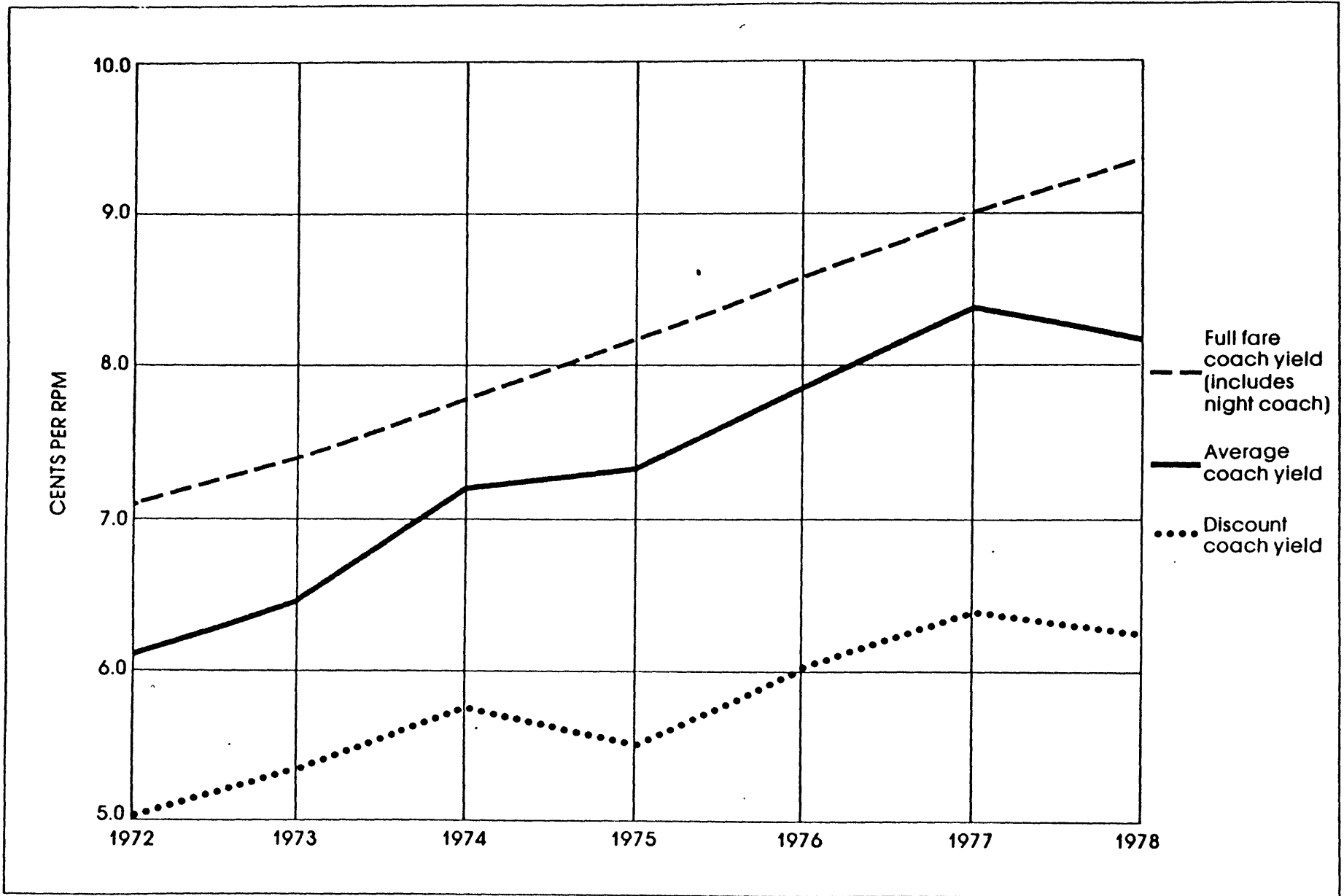


U.S. AIRLINES

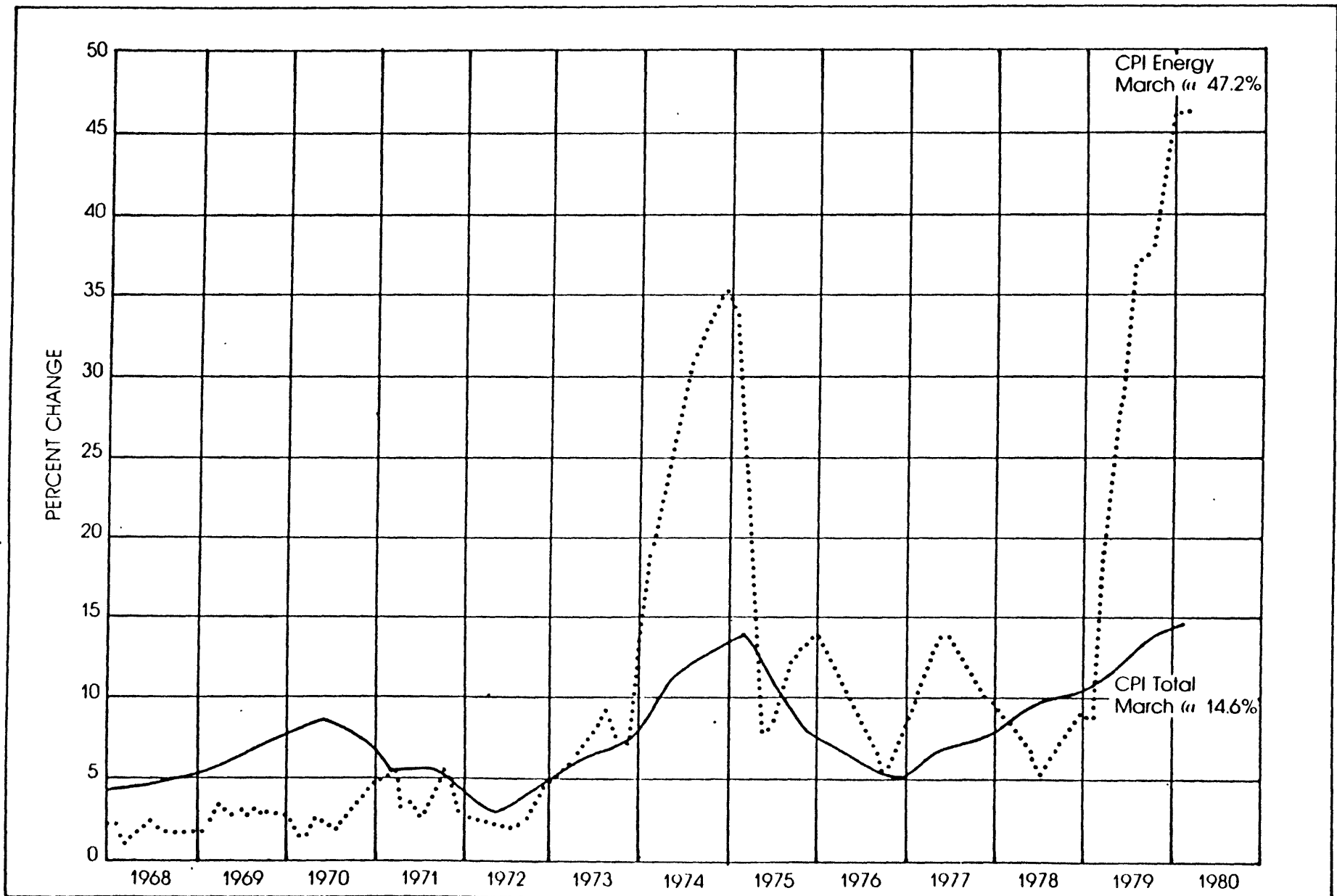
Disposable Income vs. Pleasure R.P.M.



J.S. DOMESTIC TRUNKS (48 STATES) Discount and Full Fare Yield Comparison



U.S. CPI, ENERGY AND TOTAL



U.S. DOMESTIC AIRLINES Traffic Growth



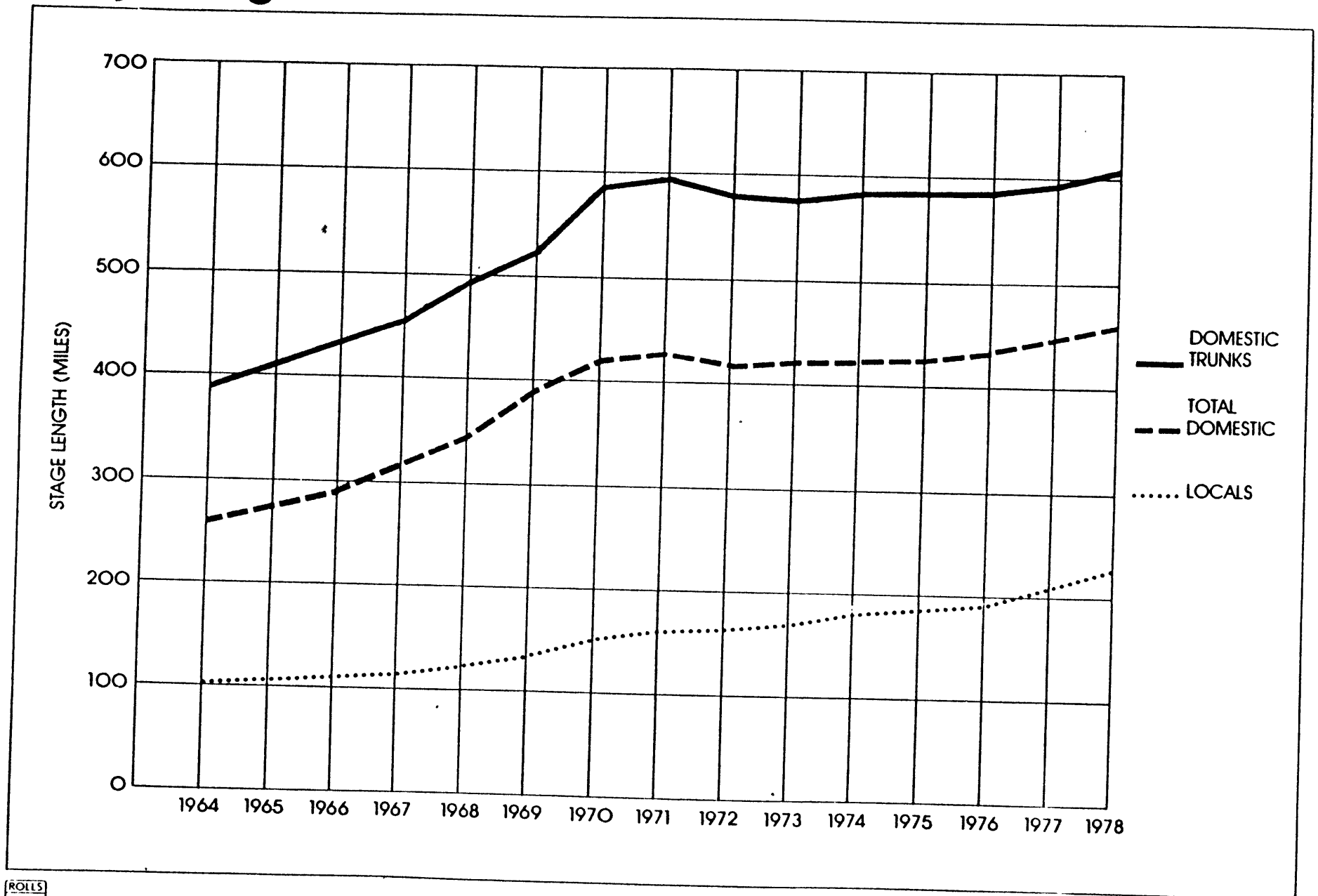
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ENERGY AND AIRLINE TRAFFIC/

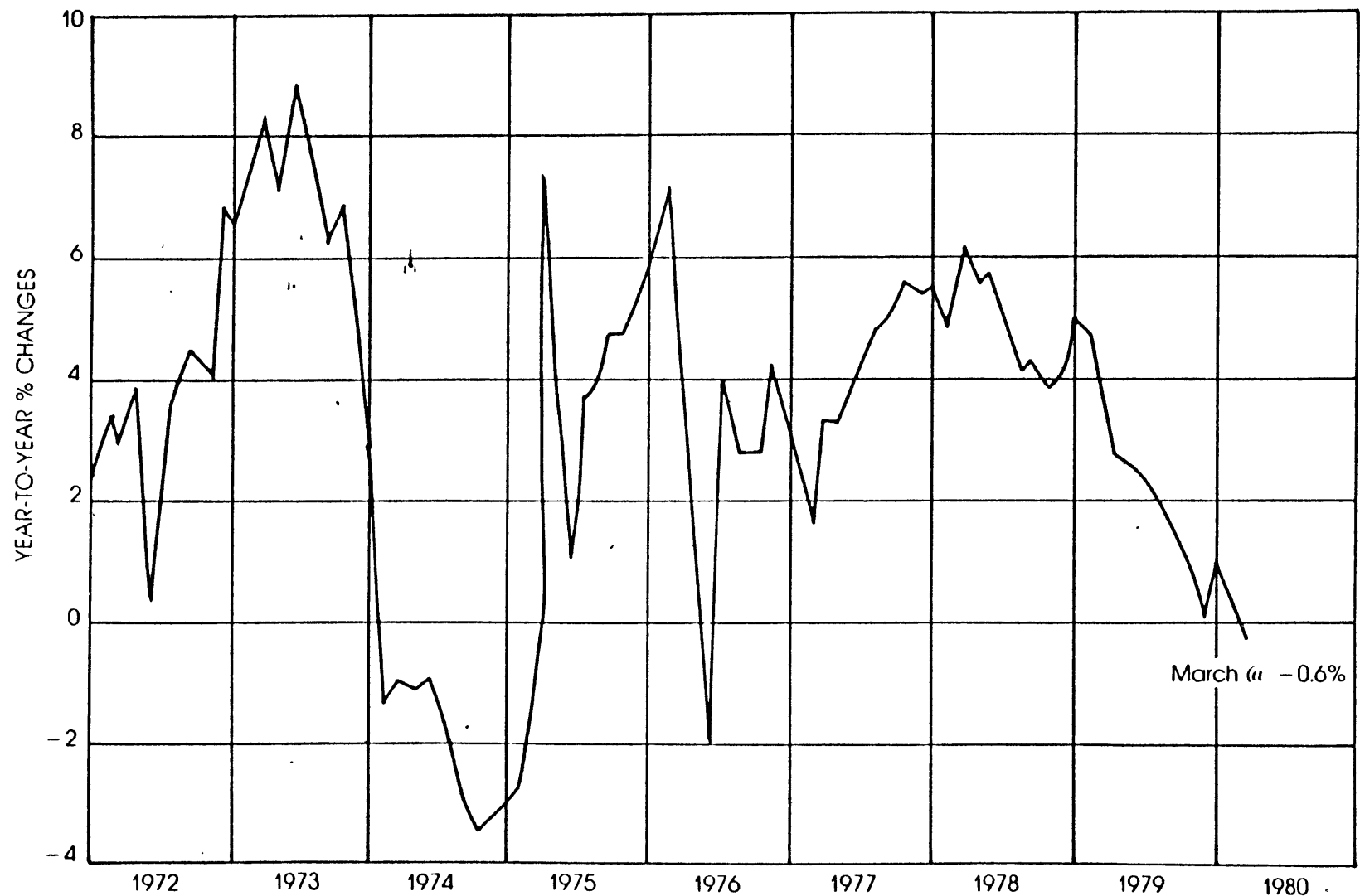
Fig. 10

J.S. AIRLINES DOMESTIC OPERATIONS Stage Lengths



U.S. REAL DISPOSABLE INCOME*

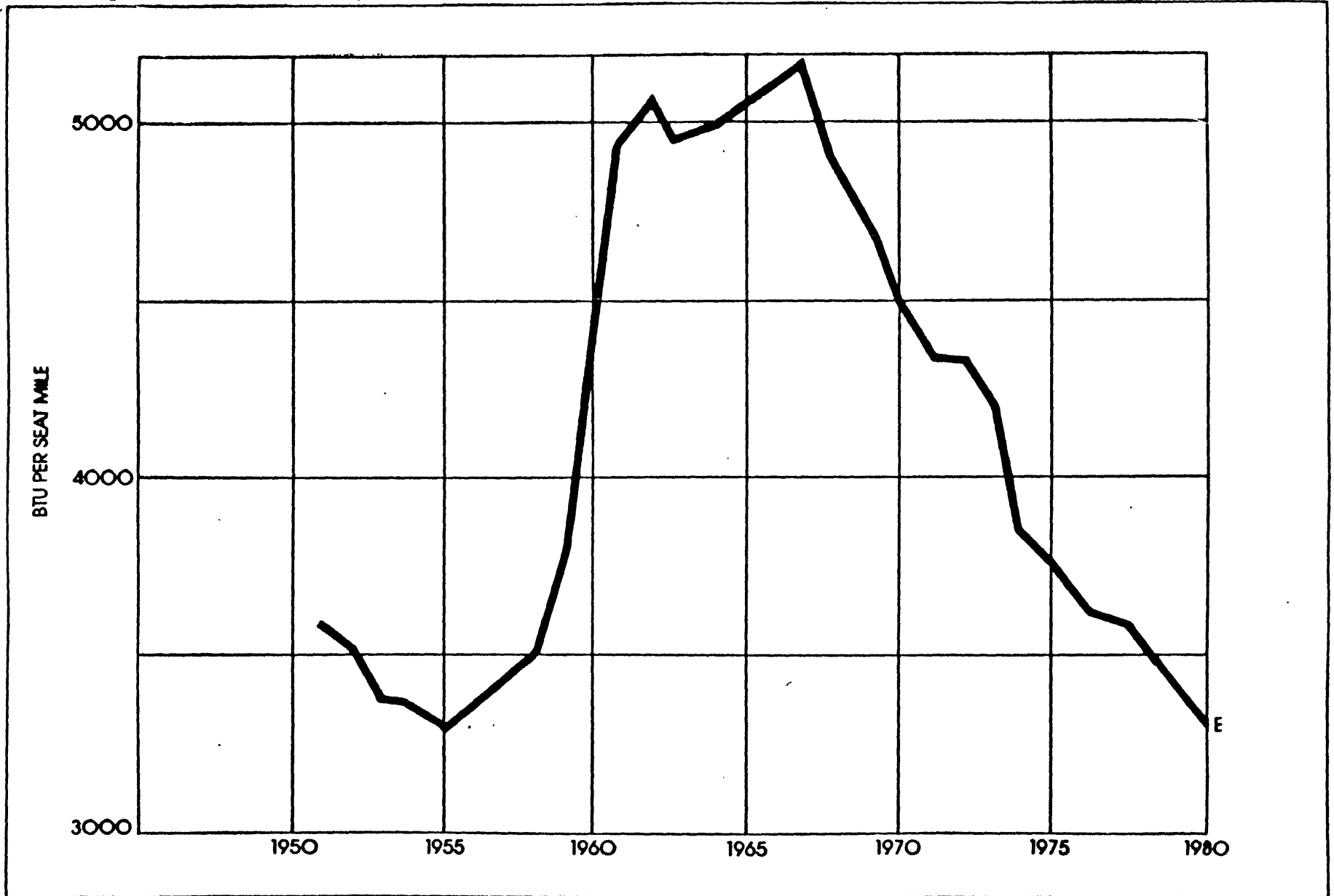
Year-to-Year % Changes



*Deflated by implicit deflator for consumption.



U.S. DOMESTIC TRUNKS Energy Consumption—BTU Per Seat Mile



U.S. TRUNKS Fuel Bum per ATM

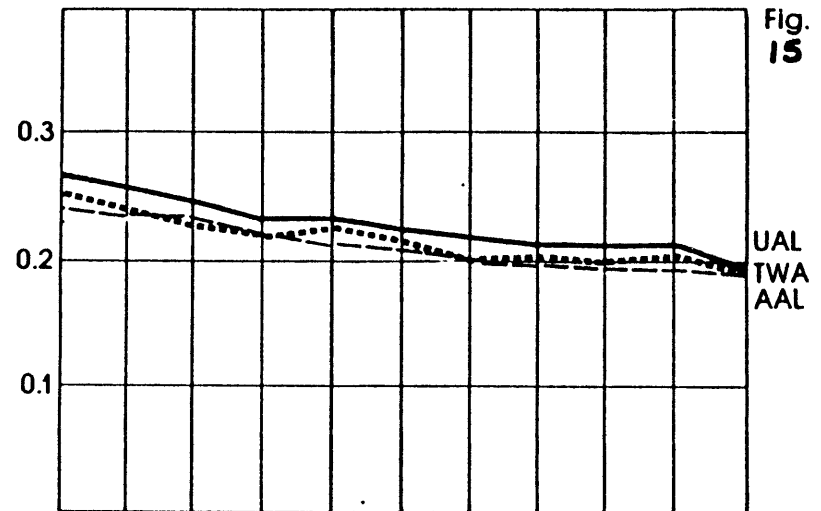
DELTA EASTERN NATIONAL

Fig. 14



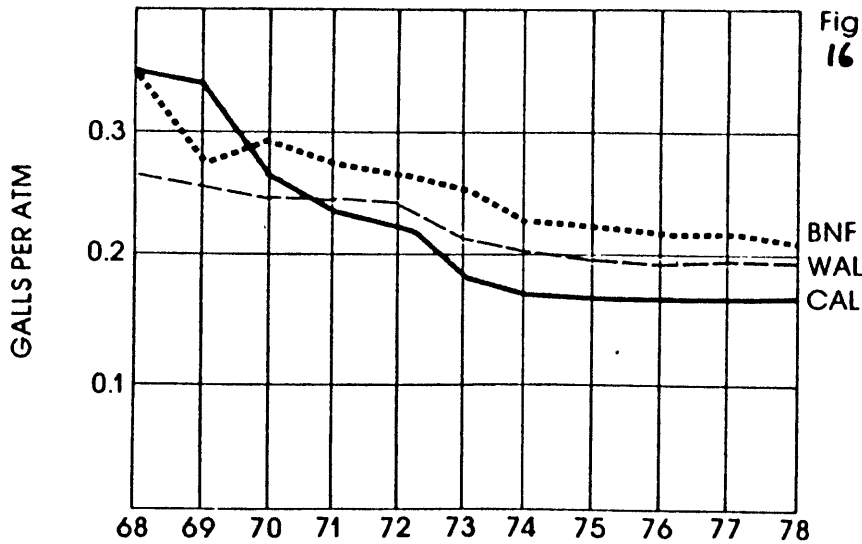
AMERICAN TWA UNITED

Fig. 15



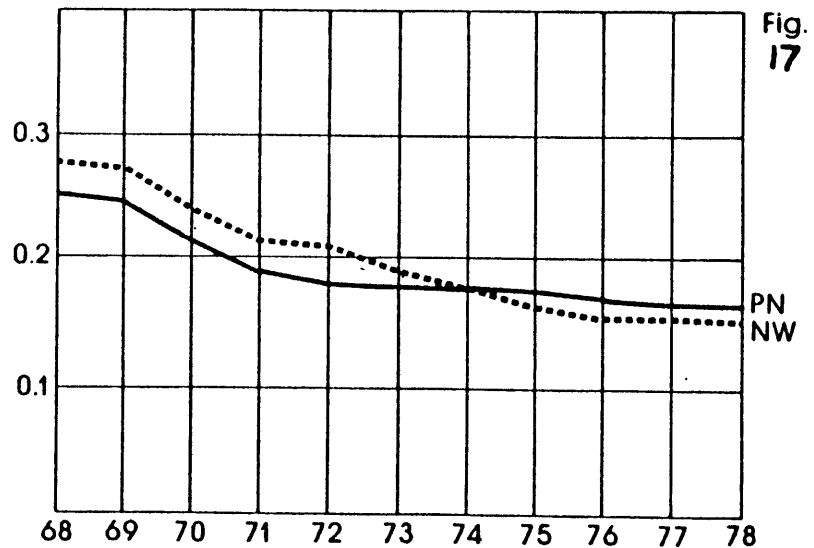
BRANIFF CONTINENTAL WESTERN

Fig. 16



NORTHWEST PAN AM

Fig. 17

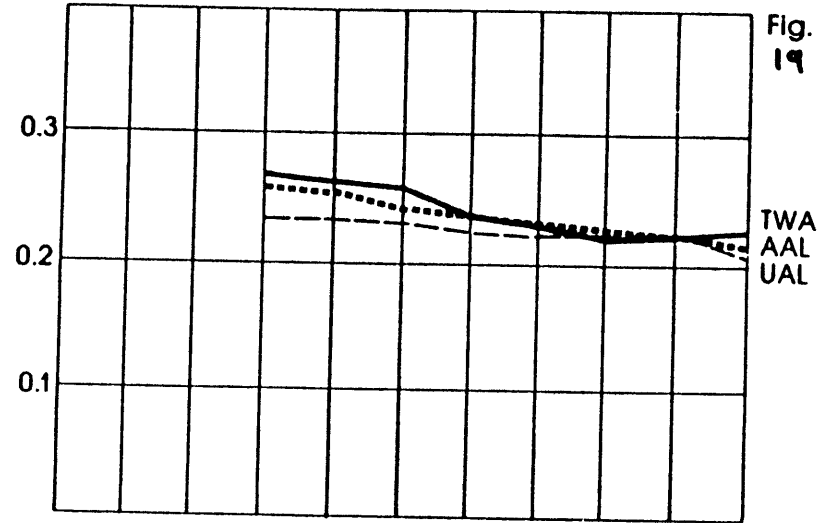


U.S. TRUNKS Fuel Burn per ATM (corrected to 500 mile Stage Length)

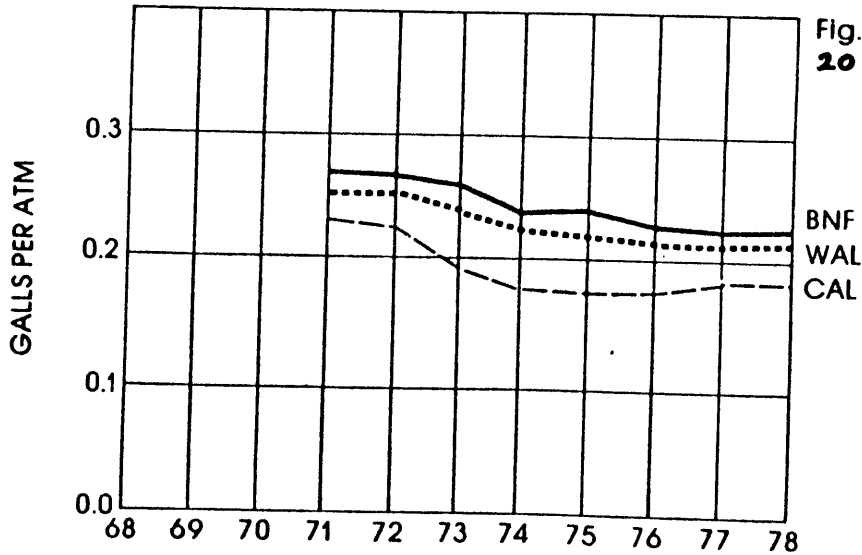
DELTA EASTERN NATIONAL



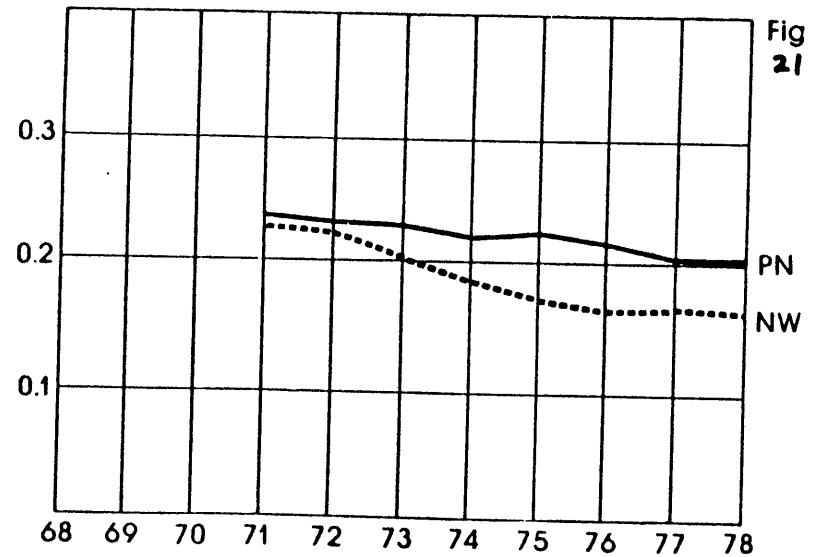
AMERICAN TWA UNITED



BRANIFF CONTINENTAL WESTERN

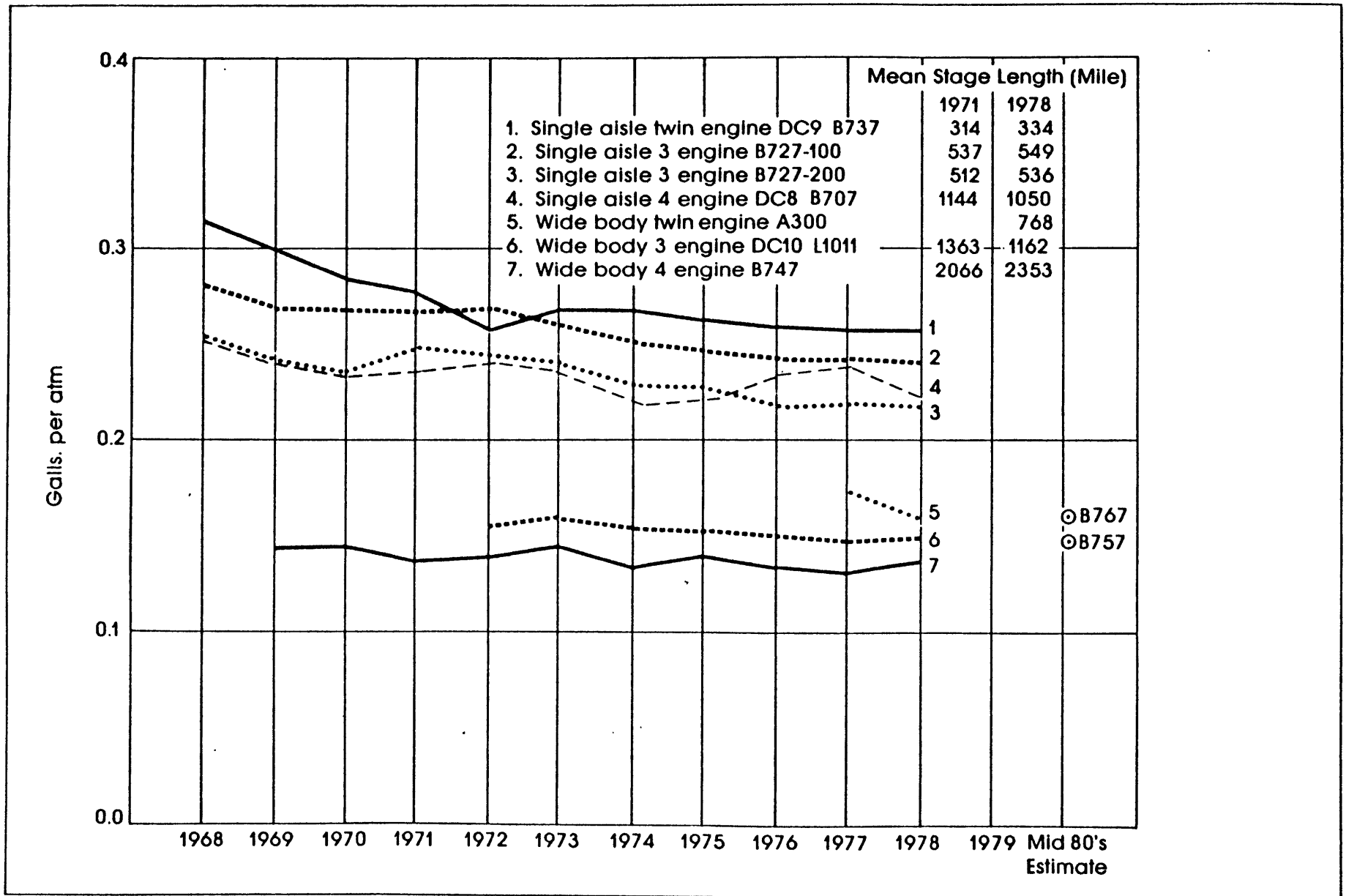


NORTHWEST PAN AM



J.S. TRUNKS

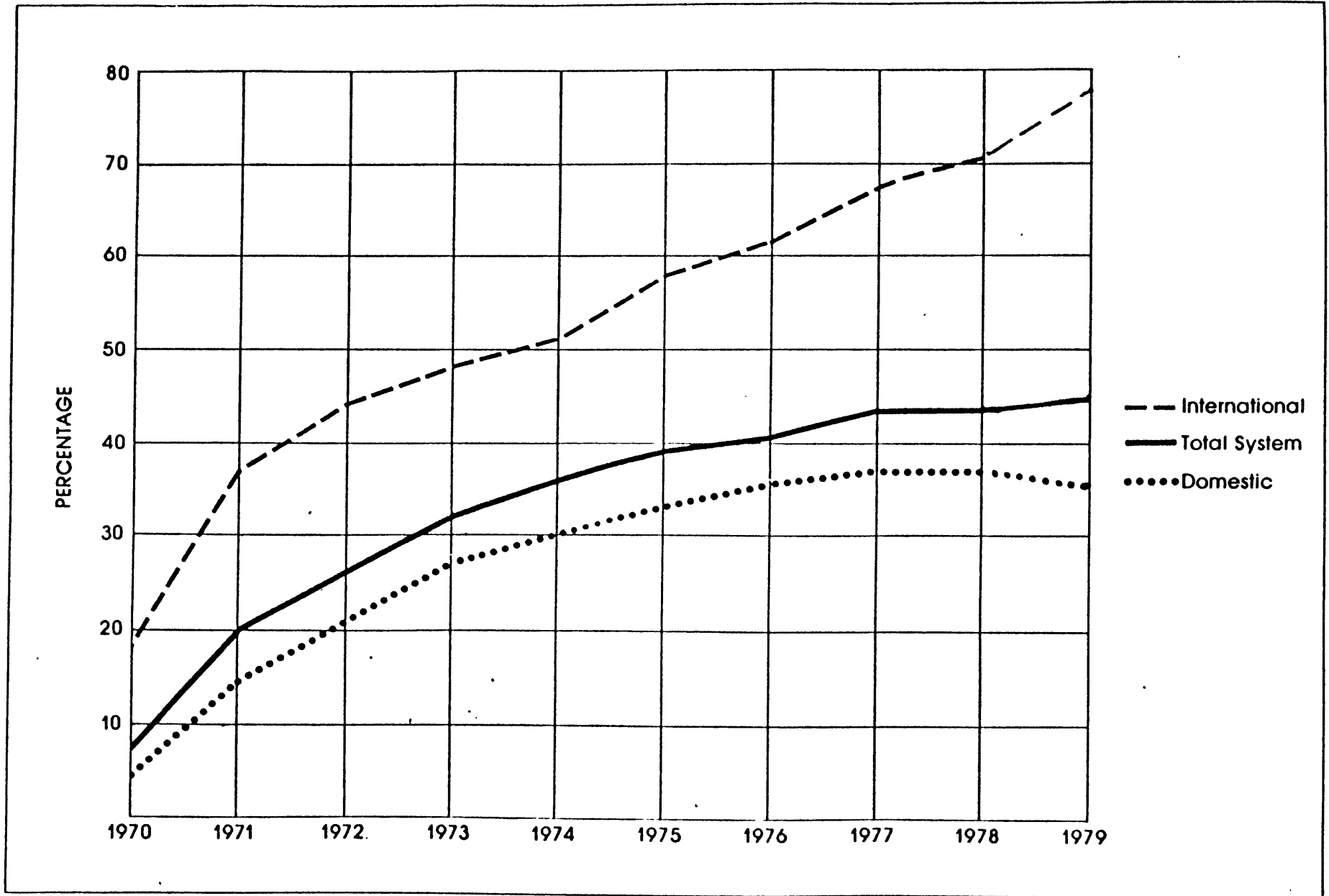
Fuel Usage By Aircraft Type



ENERGY AND AIRLINE TRAFFIC/

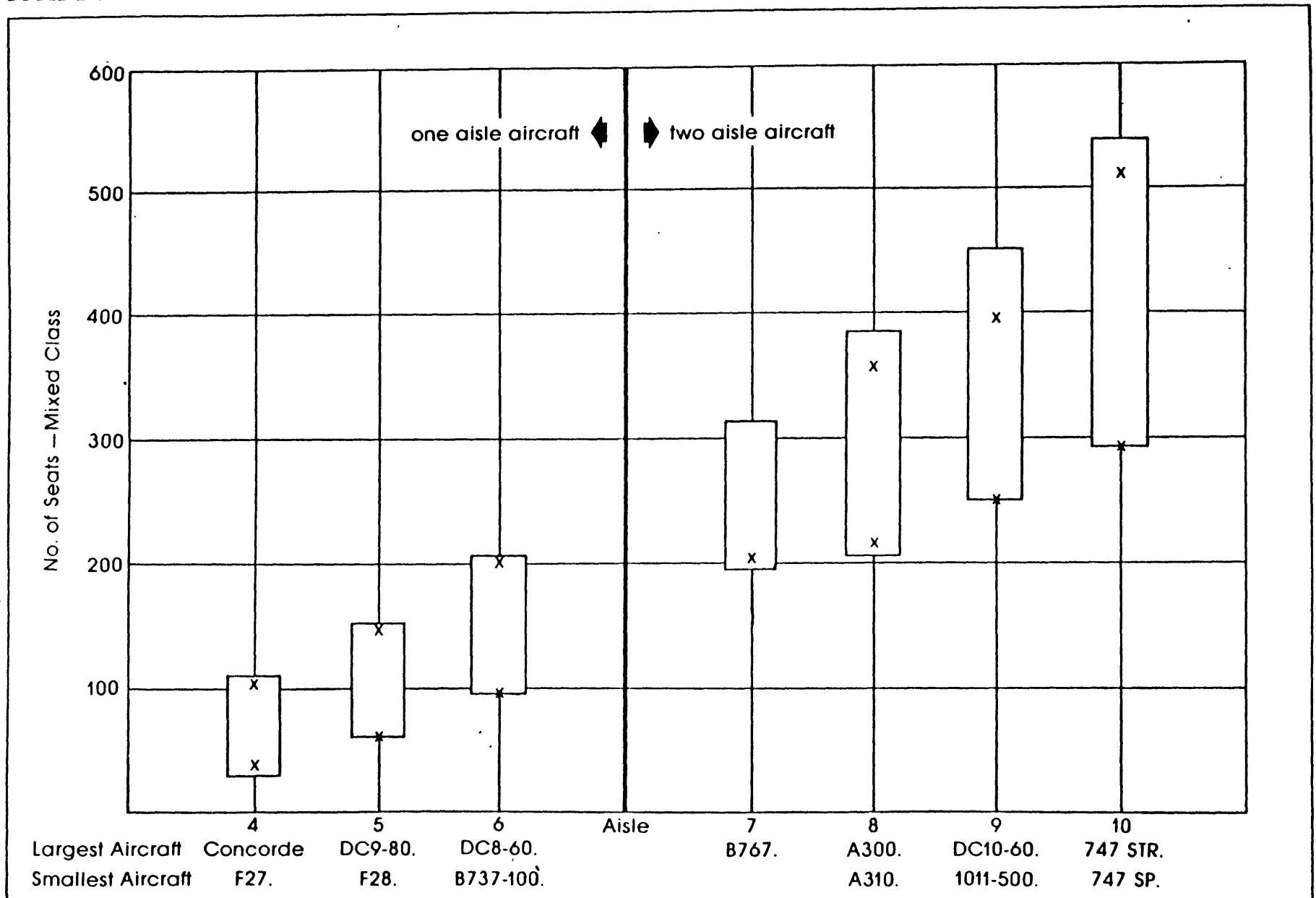
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U.S. TRUNKS Percentage A.M Flown By High Bypass Ratio Engine Aircraft



REPRESENTATIVE AIRCRAFT SIZES

Mixed Class

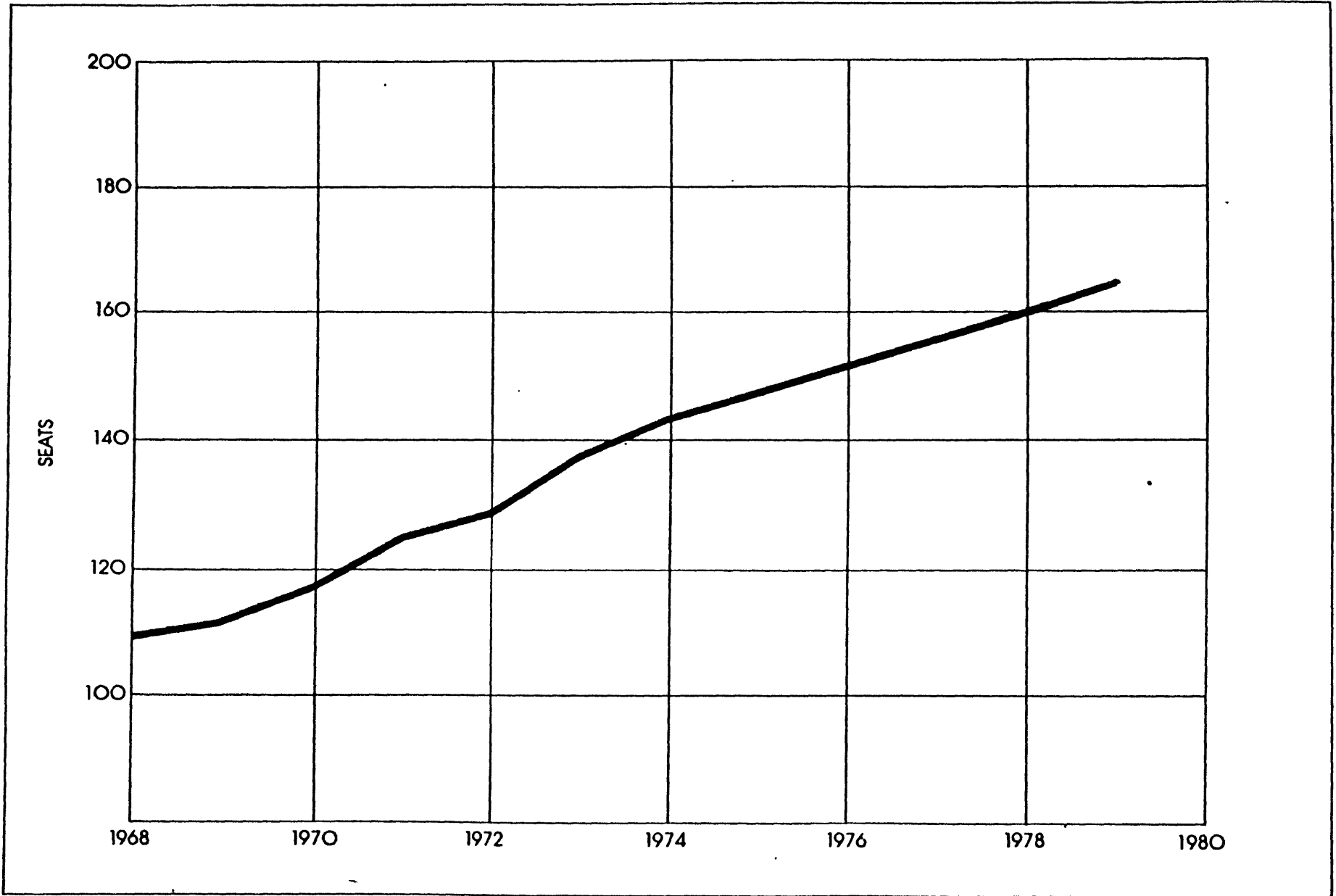


Market Planning & Analysis RRI-NY

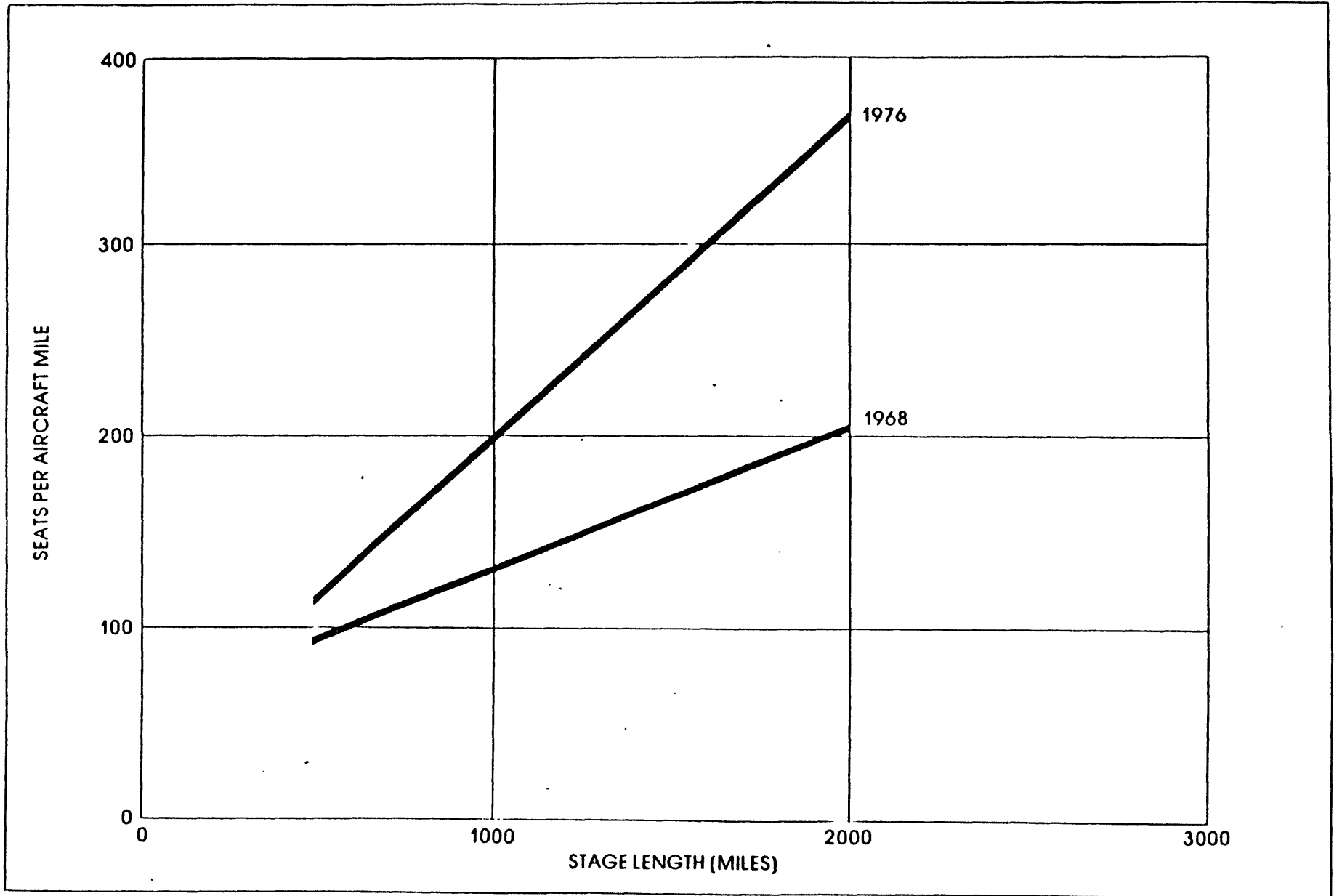


TRUNK AIRLINES INDICATORS & PROJECTIONS/JANUARY 1980

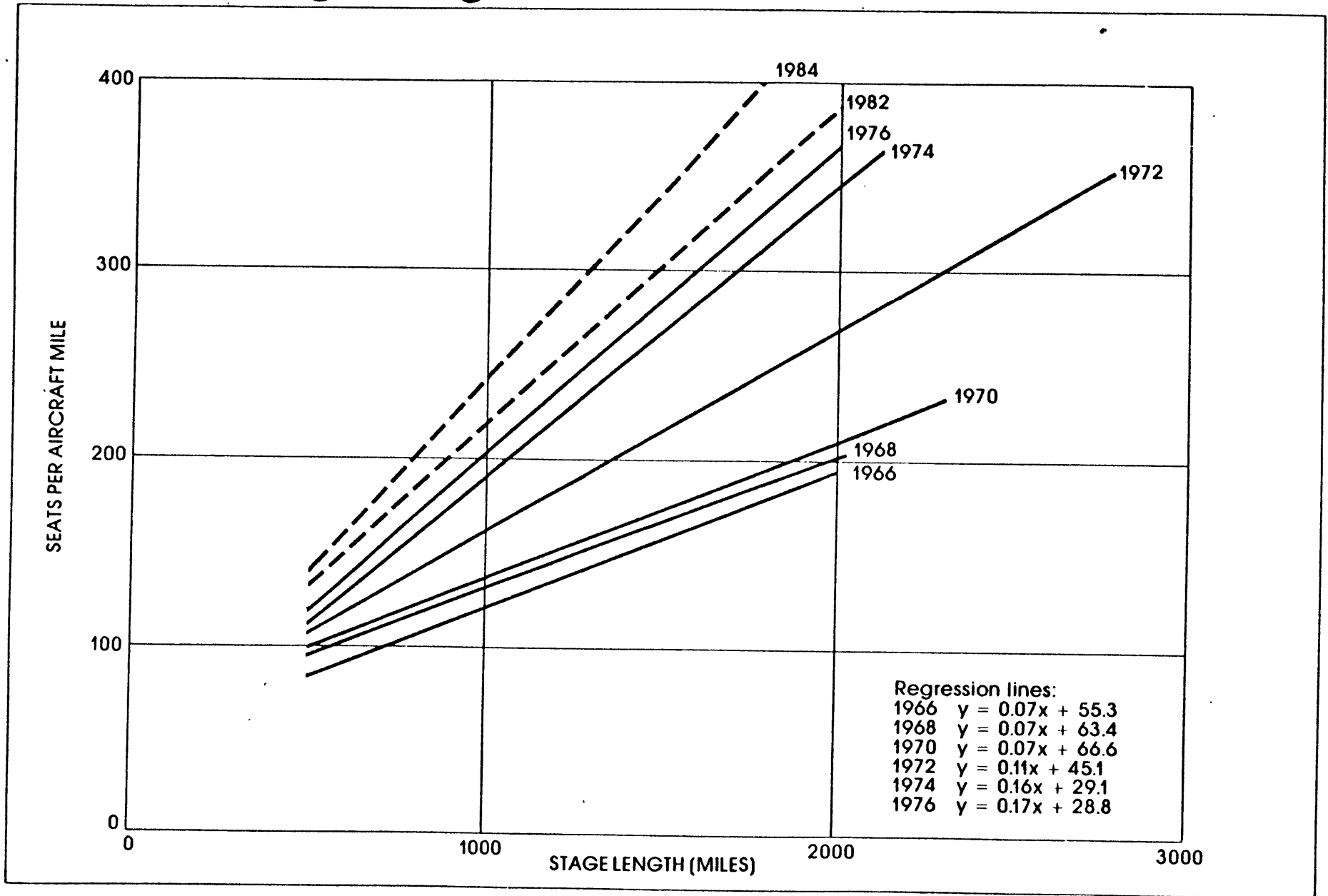
U.S. TRUNKS SEATS PER AIRCRAFT MILE



U.S. DOMESTIC AIRLINES Seats vs. Stage Length



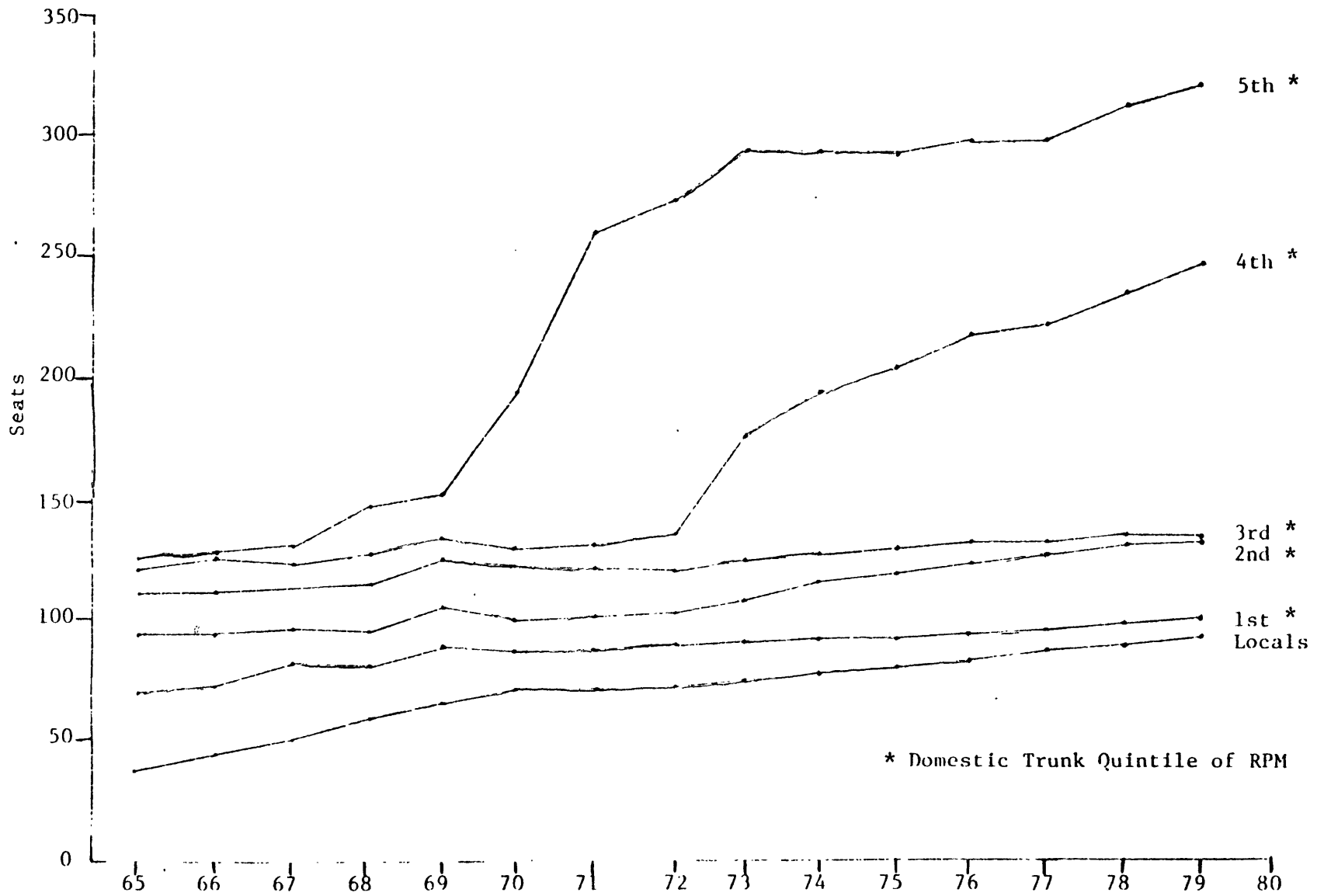
U.S. DOMESTIC AIRLINES Seats vs. Stage Length



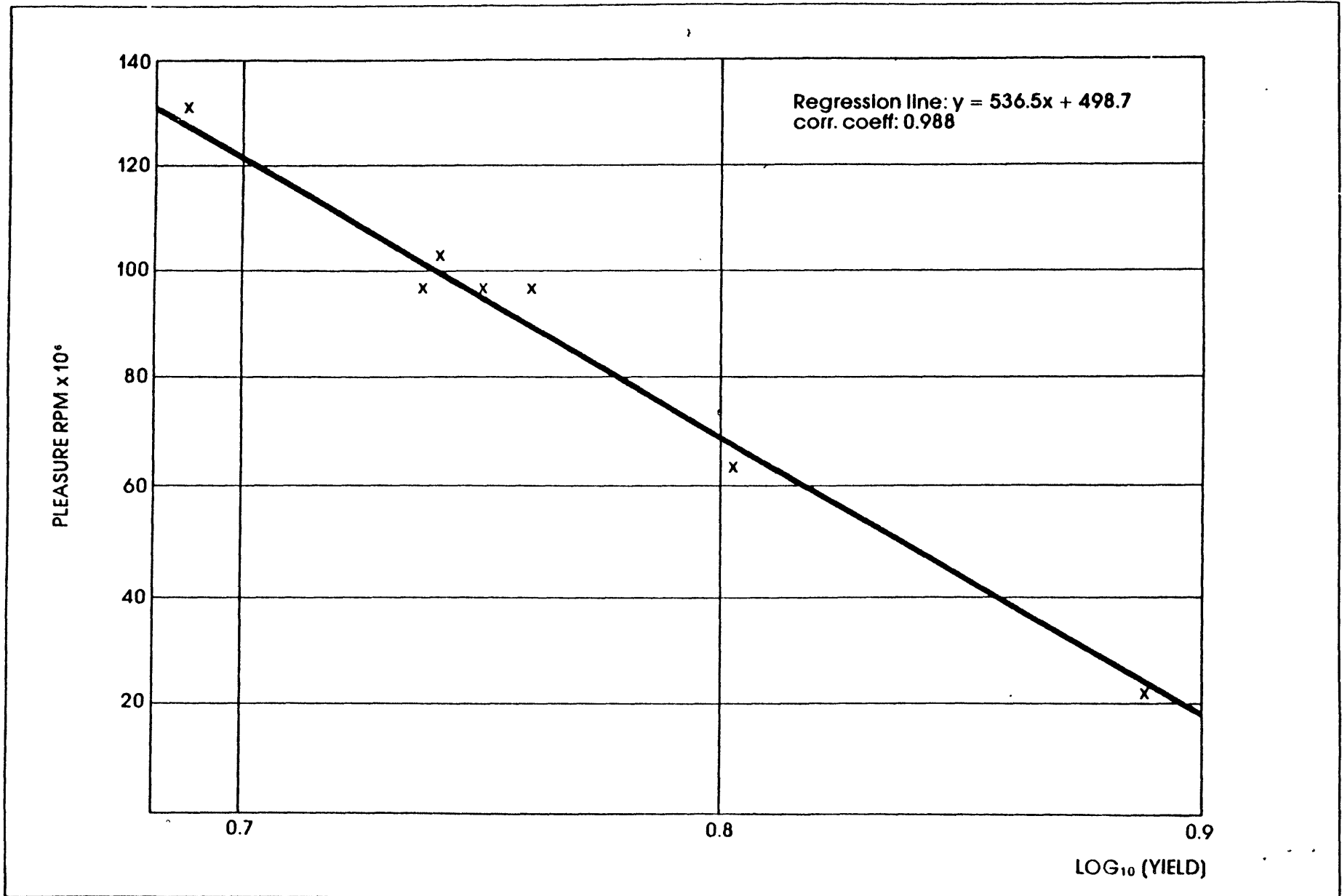


SEATS PER AIRCRAFT

Date
June '80
Chart No.



U.S. DOMESTIC AIRLINES Yield vs. Pleasure Travel



Market Planning & Analysis/RR1-NY



ENERGY AND AIRLINE TRAFFIC/