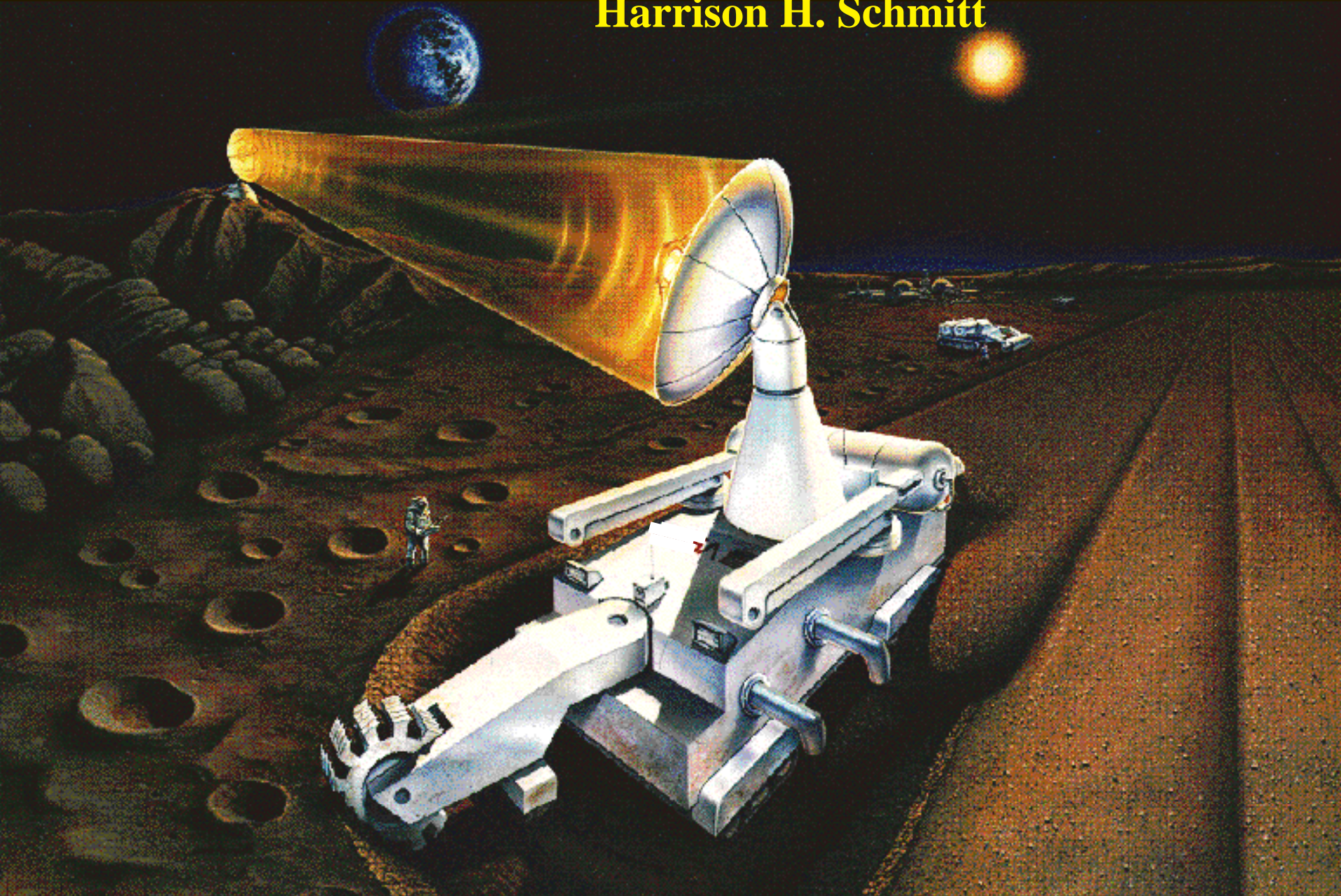
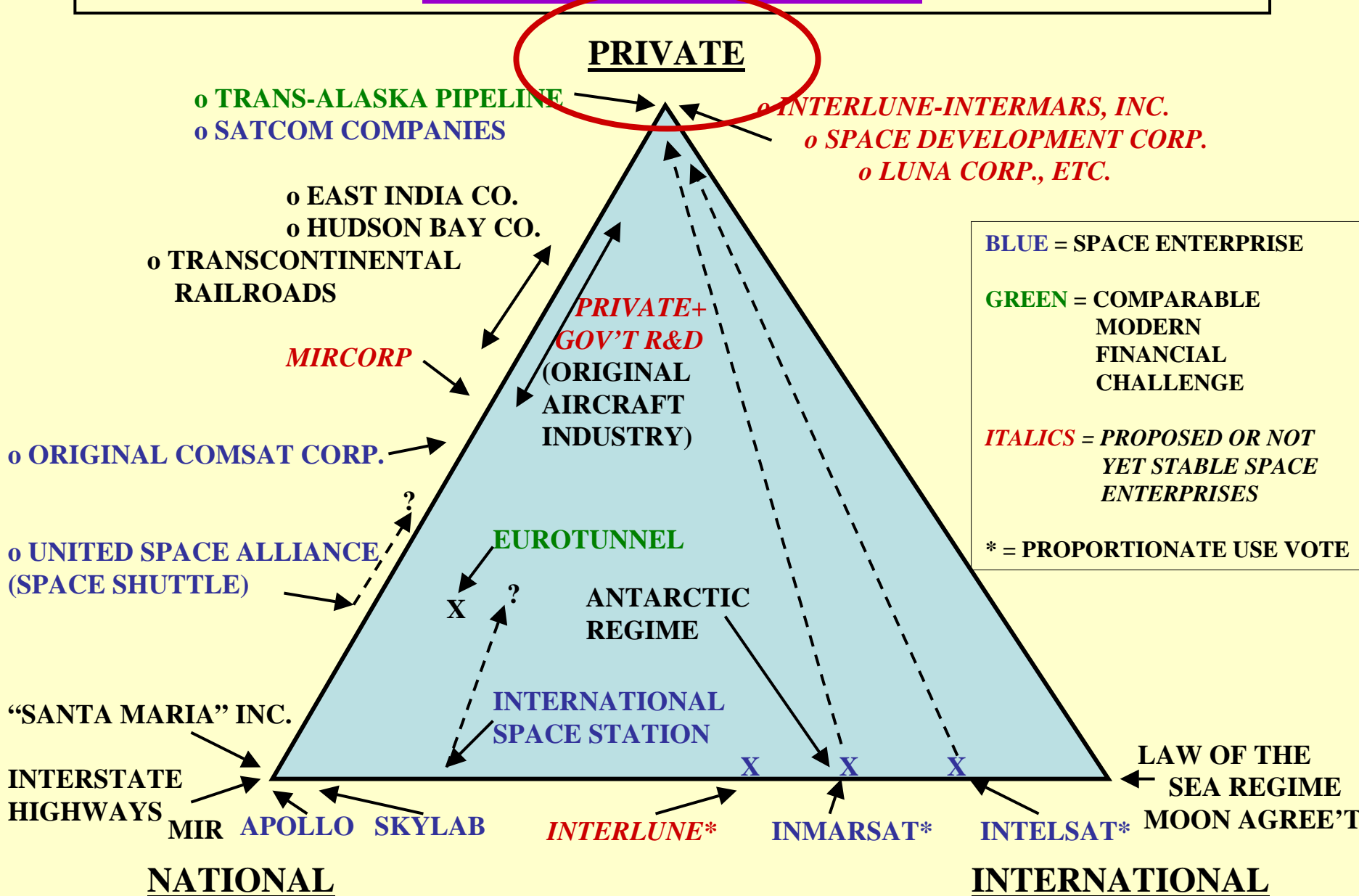


STARTING A BUSINESS: NEEP 533 LECTURE 38

Harrison H. Schmitt

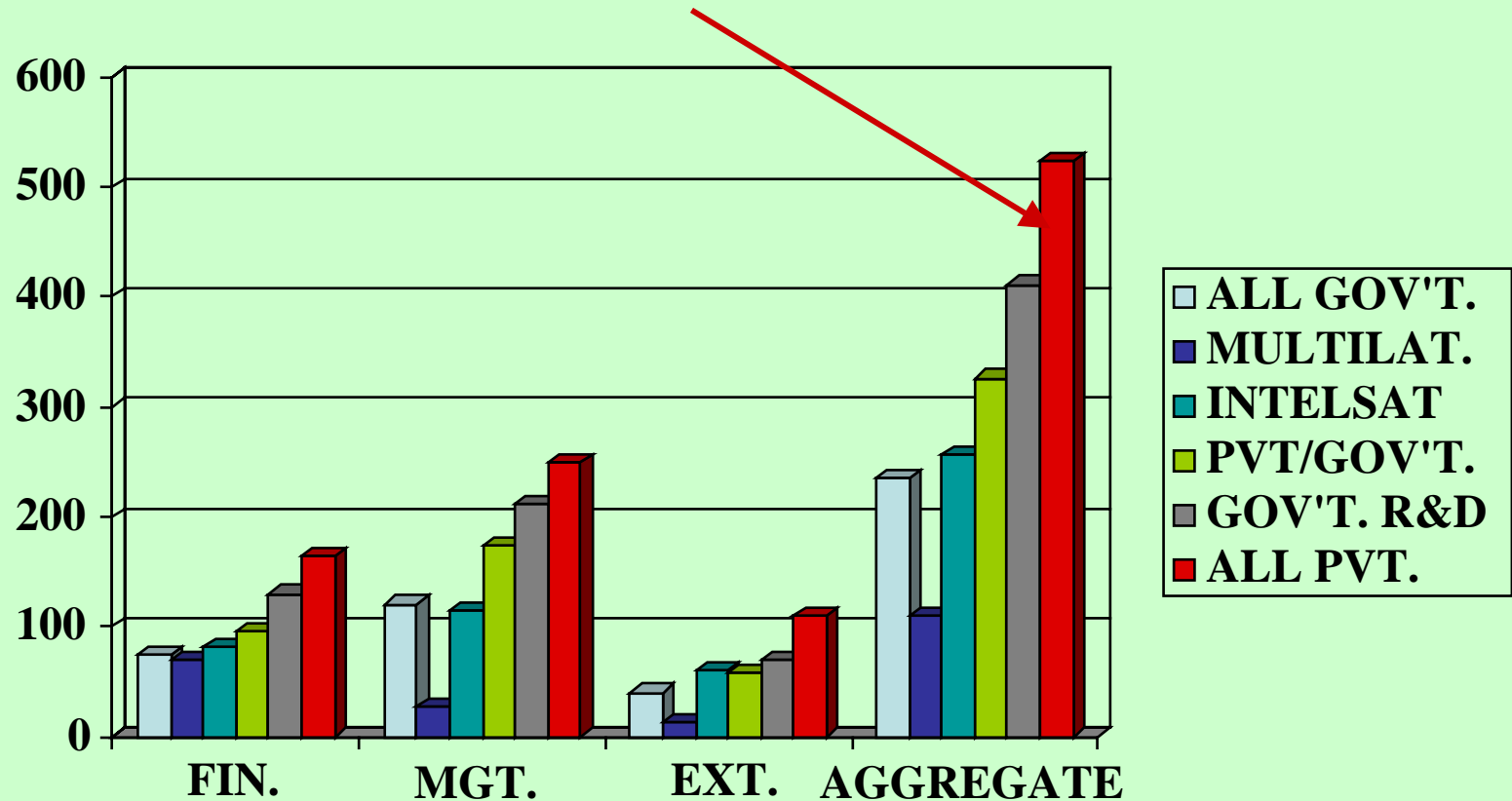


“PURE” MANAGEMENT CONTROL COMPONENTS: LARGE ENTERPRISES



SEMI-QUANTITATIVE EVALUATION OF MANAGEMENT APPROACHES

HOW WOULD AN ALL PRIVATE APPROACH WORK?



FEASIBILITY OF AN “ALL PRIVATE” LUNAR RESOURCE INITIATIVE -1

- **PROF. HOWARD THOMPSON’S ANALYSIS FOR 1999 NEEP533**
 - **PRIVATE INITIATIVE FOR LUNAR HE-3 MINING ONLY WON’T FLY**
 - **FAVORABLE RETURN ON INVESTMENT (ROI ~25%) ONLY IF GOVERNMENT A PARTNER TO FUND NECESSARY R&D AND INVESTORS WAIT 15 YEARS FOR RETURN ON INVESTMENT**
 - **GOVERNMENT BRIDGES GAPS IN TECHNOLOGY, START-UP FINANCING, AND INITIAL ROI FOR INVESTORS**
 - **GOVERNMENT GETS FREE VOLATILES AND USE OF BASE**
- **LATER, WE WILL SEE THAT THE SITUATION MAY NOT BE QUITE THIS DARK FOR A LUNAR HELIUM-3 BUSINESS**
 - **ENERGY EQUIVALENT VALUES RELATIVE TO COAL RISING**
 - **VALUE OF BY-PRODUCTS INCREASED BY BUSH INITIATIVE**
 - **LAUNCH COSTS POTENTIALLY CAN BE MUCH LOWER**
 - **TERRESTRIAL POWER RETURNS HIGH ENOUGH TO SUBSIDIZE START-UP OF LUNAR BUSINESS IF NECESSARY**

FEASIBILITY OF AN “ALL PRIVATE” LUNAR RESOURCE INITIATIVE -2

- **ALTERNATIVE APPROACH**
 - **BRIDGE TECHNOLOGY, FINANCING, AND ROI GAPS WITH NEAR-TERM BUSINESSES**
 - **BASE ON SPIN-OFF OF FUSION RELATED TECHNOLOGIES**
 - **PET ISOTOPE PRODUCTION AT POINT-OF-USE - ONE WATT OF FUSION POWER**
 - **USE OF PROTONS AND NEUTRONS: THERAPEUTIC ISOTOPE PRODUCTION AND ACTIVATION ANALYSIS - KILOWATTS OF FUSION POWER**
 - **MODULAR POWER UNITS FOR MOBILE APPLICATIONS - >>BREAK-EVEN (Q>5?)**
 - **MODULAR AND CENTRAL STATION POWER PLANTS - LUNAR HE-3 REQUIRED**
- **GETTING STARTED REQUIRES FINANCING OF START-UP DEVELOPMENT OF ISOTOPE PRODUCTION BUSINESS**

ISOTOPE PRODUCTION START-UP DEVELOPMENT

- **TECHNOLOGY**

- RESEARCH PLAN
- IMPLEMENT AS RAPIDLY AS FINANCING PERMITS
- IDENTIFY AND PATENT “IP”

- **FINANCING**

- BUSINESS PLAN
- SEARCH FOR FUNDING SOURCE
- ESTABLISH MANAGEMENT TEAM

I. TYPES OF FINANCING

- **PRE-PAID CONTRACTS (REVENUES)**
- **GRANTS**
 - **GOVERNMENT OR PRIVATE**
- **DEBT**
 - **BANK OR PRIVATE**
- **EQUITY**
 - **PUBLIC**
 - **INITIAL PUBLIC OFFERING**
 - **SECONDARY PUBLIC OFFERING**
 - **PRIVATE**
- **CONVERTIBLE DEBT**
 - **PRIVATE: DEBT TO STOCK**



PRE-PAID CONTRACTS

- **PROS**

- NO REPAYMENT REQUIREMENTS (GENERALLY)
- NO DILUTION OF FOUNDERS EQUITY
- EXTREMELY FLEXIBLE TERMS

- **CONS**

- GENERALLY HARD TO GET
- SUBJECT TO COMPETITION AND PERFORMANCE MILESTONES

- **NOT LIKELY FOR START-UP DEVELOPMENT**

- POSSIBLE ONCE MANUFACTURING PROTOTYPE IS DEMONSTRATED

GRANTS

- **PROS**

- NO REPAYMENT REQUIREMENTS (GENERALLY)
- NO DILUTION OF FOUNDERS EQUITY
- EXTREMELY FLEXIBLE TERMS
- MANY OPTIONS FOR USE

- **CONS**

- MAY BE HARD TO GET ENOUGH TO GET STARTED
- SUBJECT TO PERFORMANCE MILESTONES
- OFTEN SUBJECT TO STRICT REPORTING REQUIREMENTS

- **NOT LIKELY FOR START-UP DEVELOPMENT**

- SBIRS ARE POSSIBLE

DEBT

- **PROS**

- LIMITED UPSIDE PAYMENTS
- EASY TO FIND (AS OPPOSED TO “GET”) AND UNDERSTAND
- WELL-ESTABLISHED INDUSTRY
- MAY BE NO VALUATION NEGOTIATION

- **CONS**

- ALMOST IMPOSSIBLE TO GET FOR PRE-REVENUE COMPANIES
 - PERSONAL GUARANTEE (INDIVIDUAL NET WORTH)
- COVENANTS MAY SERIOUSLY LIMIT MANAGEMENT FLEXIBILITY
- SENIOR POSITION IN REPAYMENTS WHEN COMPANY IN TROUBLE
- NOT TIED TO YOUR REVENUE STREAMS
 - MAY BE TIED TO YOUR RECEIVABLES, INVENTORY, ETC.

- **NOT LIKELY FOR START-UP DEVELOPMENT**

- FRIENDS, FAMILY AND FOOLS (FFF) MIGHT STEP UP

PRIVATE EQUITY

- **PROS**

- NO REPAYMENT UNTIL “EXIT” POINT IS REACHED
 - I.E., IPO OR SALE OF COMPANY
- ALIGNMENT OF INTERESTS
- POSSIBLE TO GET FOR EARLY STAGE FIRMS
- MAY ATTRACH STRATEGIC PARTNER(S)

- **CONS**

- DILUTION OF FOUNDERS EQUITY
- EXIT MAY BE REQUIRED AT SOME POINT
 - PARTICULARLY FOR VENTURE CAPITAL
- SHARED OWNERSHIP STRUCTURE
 - MAY HAVE MORE MANAGEMENT “HEP” THAN YOU WANT
- VALUATION NEGOTIATION

- **POSSIBLE FOR START-UP DEVELOPMENT**

- “ANGEL” OR MINI-ANGELS / NOT VENTURE CAPITAL
 - VENTURE CAPITAL IS LOOKING FOR EXIT IN 3-5 YEARS

PUBLIC EQUITY

- **PROS**

- LIQUIDITY FOR INVESTORS AND (TO A LESSER DEGREE) OTHER SHAREHOLDERS
- LONG-TERM BUSINESS VIABILITY
 - PROVIDED THERE IS GOOD MANAGEMENT AND A VIABLE BUSINESS PLAN

- **CONS**

- NORMALLY NOT AVAILABLE TO EARLY STAGE FIRMS
- NORMALLY REQUIRES >3 YEARS TRACK RECORD IN THE MARKET
 - E-COMMERCE WAS THE RECENT EXCEPTION / THAT PROVES THE RULE
- EXPENSIVE TO ACCESS
- VERY STRINGENT FEDERAL REPORTING REQUIREMENTS

- **NOT AVAILABLE TO START-UP DEVELOPMENT**

CONVERTIBLE DEBT

(DEBT WITH CONVERSION TO STOCK AT AGREED STOCK PRICE)

• PROS

- LIMITED UP-FRONT VALUATION DISCUSSION
- CAN SERVE AS AN EFFECTIVE BRIDGE INSTRUMENT WHEN EQUITY MARKET LIMITED
- FAST
- ACCESSIBLE TO COMPANIES AT MANY STAGES

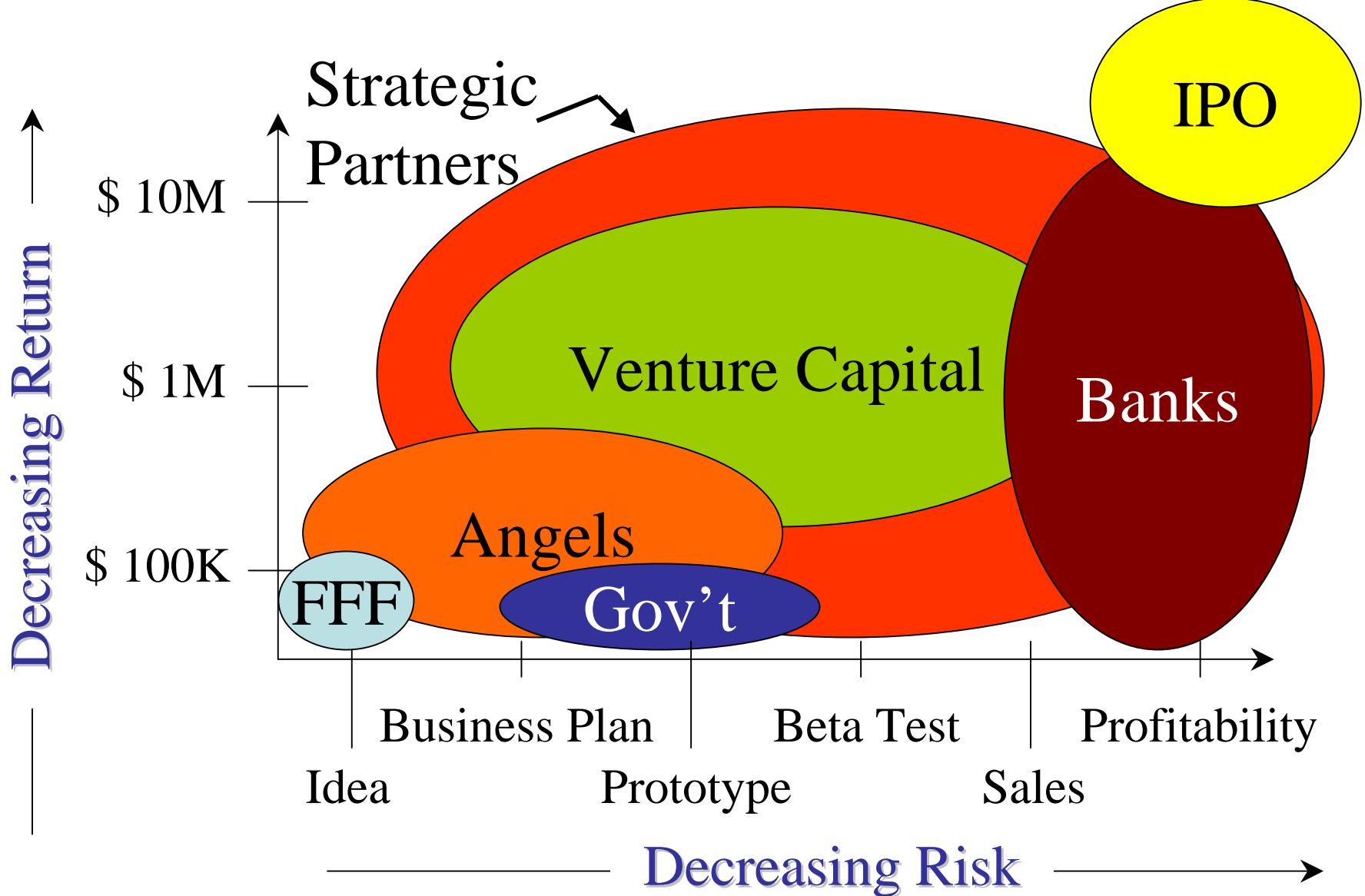
• CONS

- ALMOST ALWAYS HAS “WARRANT COVERAGE”
 - CAN BE MARKET OVERHANG ON STOCK PRICE
- DECISION TO CONVERT LIES WITH INVESTORS
 - COMPANY CAN INFLUENCE THE DECISION SOMETIMES
- INTERST PAYMENTS AFFECT CASH FLOW
- WOULD REQUIRE A FUTURE ACCESS TO CAPITAL TO FORCE CONVERSION

• NOT AVAILABLE TO START-UP DEVELOPMENT

II. SOURCES OF FINANCING

- **AVAILABLE TO START-UP DEVELOPMENT**
 - **UNSOPHISTICATED INVESTORS (A.K.A. THE 3F'S)**
 - **MINI-ANGELS**
 - **ANGELS**
- **AVAILABLE AFTER START-UP DEVELOPMENT COMPLETE**
 - **VENTURE CAPITALISTS**
 - **STATE OR FEDERAL GOVERNMENT**
 - **STRATEGIC PARTNERS**
- **AVAILABLE AFTER TRACK RECORD ESTABLISHED**
 - **PUBLIC EQUITY MARKETS (THE MAGIC IPO)**
 - **COMMERCIAL BANKS (“WHEN YOU DON’T NEED IT”)**



FINANCING RETURN ON INVESTMENT VS. RISK

MODIFIED AFTER
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UNSOPHISTICATED INVESTORS (3F'S)

- **PROS**

- EASY TO ACCESS
- OFTEN ATTRACTIVE VALUATION OR TERMS
- EXTREMELY FLEXIBLE TERMS (DEBT, EQUITY OR BOTH)

- **CONS**

- USUALLY ONLY AVAILABLE FOR SEED OR PRE-SEED ROUND
- VALUE-ADD TO THE BUSINESS UNCERTAIN (ROLE IN CO.)
- CAN BE HARD ON PERSONAL RELATIONSHIPS

- **MAY BE AVAILABLE FOR START-UP DEVELOPMENT**

ANGELS/MINI-ANGELS

- **PROS**

- ABLE TO DECIDE QUICKLY
- HIGHER LEVEL OF SOPHISTICATION THAN 3F'S
- POSSIBILITY OF VALUE-ADD BEYOND JUST MONEY

- **CONS**

- HARD TO FIND (USUALLY)
- TYPICALLY ONLY INTERESTED IN INVESTING IN THEIR LOCAL GEOGRAPHIC AREA
- USUALLY HAVE PARTICULAR INVESTMENT CRITERIA
- HAVE TO WATCH FOR CON-ARTISTS

- **MAY BE AVAILABLE FOR START-UP DEVELOPMENT**

VENTURE CAPITALISTS

- **PROS**

- VALUE-ADD BEYOND MONEY (MANAGEMENT, CONTACTS, FINANCE LEADS)
- ADDED CREDITABILITY WITH BUSINESS COMMUNITY
- POTENTIAL FOR SYNDICATES AND FOLLOW-ON FUNDING
- REQUIRE STRONG MANAGEMENT TEAM IN PLACE

- **CONS**

- STRINGENT INVESTMENT CRITERIA
- VALUATION USUALLY VERY TOUGH
- SLOWER TO ACT THAN ANGELS OR 3F'S
- EXIT EXPECTED (AND USUALLY REQUIRED) WITHIN 3-5 YEARS

- **MAY BE AVAILABLE TO START-UP DEVELOPMENT**

- WITH SUCCESSFUL MANUFACTURING PROTOTYPE

STATE OR FEDERAL GOVERNMENT

- **PROS**

- NO DILUTION OF EQUITY
- MANY DIFFERENT SOURCES (SBIR, STTR, CRADA, COMPETITIVE BID)

- **CONS**

- STRINGENT REPORTING REQUIREMENTS
- TERMS MAY NOT MATCH COMPANY GOALS
- INTELLECTUAL PROPERTY OWNERSHIP QUESTIONS
- HIGHLY POLITICAL PROCESS

- **DIFFICULT FOR START-UP DEVELOPMENT**

- TAKES TIME, SOME CASH AND POSSIBLY SOME POLITICAL CONNECTIONS

STRATEGIC PARTNERS

- **PROS**

- MANY DIFFERENT OPTIONS (EARLY, LATE, EQUITY, DEBT)
- OFTEN ATTRACTIVE VALUATION OR TERMS
- CAN SERVE AS BOTH A FINANCING SOURCE AND AN EXIT
- NON-CASH BENEFITS (MANUFACTURING, MARKETING, SALES, DISTRIBUTION, PROCUREMENT)

- **CONS**

- HARD TO DEVELOP CONTACT WITH RIGHT PARTNER
- POTENTIAL FOR EXPLOITATION (BIG CO./SMALL CO.)
- CAN LIMIT RELATIONSHIPS WITH COMPETITIVE FIRMS
- BOARD MEMBERSHIP MAY CREATE CONFLICTS

- **MAY BE POSSIBLE FOR START-UP DEVELOPMENT**

- MAKE A NEW MARKET FOR THE PARTNER

PUBLIC EQUITY MARKETS

- **PROS**

- SERVES AS AN EXIT STRATEGY AS WELL AS FINANCING
- MAJOR “BRANDING” EVENT
- EASIER TO GET FOLLOW-ON FUNDING (DEBT & EQUITY)

- **CONS**

- DEPENDS UPON AN “IPO WINDOW”
- MANY SEC REPORTING REQUIREMENTS
- AUDITED FINANCIAL STATEMENTS REQUIRED
- EXTREMELY EXPENSIVE

- **NOT AVAILABLE FOR START-UP DEVELOPMENT**

COMMERCIAL BANKS

- **PROS**

- LIMITED COST (INTEREST RATE + FEES)
- LONG-TERM RELATIONSHIP (NO EXIT)
 - PROVIDED YOU DO NOT GET INTO FINANCIAL TROUBLE

- **CONS**

- MUST HAVE ASSETS TO ACCESS (REVENUES, RECEIVABLES, HARD ASSETS)
- AUDITED FINANCIAL STATEMENTS PROBABLY REQUIRED
- TYPICALLY REQUIRE COVENANTS OR GUARANTEES

- **NOT AVAILABLE FOR START-UP DEVELOPMENT**

- EXCEPT WITH PERSONAL GUARANTEES AGAINST HARD ASSETS

COMMERCIAL PRECEDENTS IN SPACE



- **GEOSYNCHRONOUS COMMUNICATION SATELLITES AND SATELLITE COMMUNICATIONS SERVICES (MANY EXAMPLES WITH MORE APPEARING EVERY YEAR)**
- **LOW EARTH ORBIT COMMUNICATION SATELLITE CONSTELLATIONS**
 - **IRIDIUM, ODESSEY, GEODESIC, ORBCOMM, ICO, ETC.**
 - **LOTS OF INVESTMENT**
 - **NO CLEAR SUCCESSES**
 - **MISSED WINDOW OF OPPORTUNITY RELATIVE TO CELLULAR**
 - **BANKRUPTCIES CLEARED DEBT**
 - **DUST HASN'T SETTLED**

COMMERCIAL PRECEDENTS IN SPACE



- **LOW EARTH ORBIT REMOTE SENSING SATELLITE CONSTELLATIONS**
 - EARTHWATCH, ORBIMAGE, SPOTIMAGE, LOCKHEED/MARTIN, ETC.
 - MARKET JURY STILL OUT
- **LAUNCH SERVICES (GOVERNMENT AN ESSENTIAL ANCHOR CUSTOMER IN ALL CASES SO FAR)**
 - ORBITAL SCIENCES' TRANSFER ORBIT STAGE, PEGASUS, AND TAURUS
 - BOEING / MCDONNELL DOUGLAS DELTA AND ATLAS (SORT OF) FAMILIES
 - ARIANE (SORT OF)
 - RUSSIAN STABLE: MARKET PRICED TO WIN

ARE THERE PRECEDENTS FOR "REALLY BIG" PRIVATE SPACE INITIATIVES -1

- **SIMILAR SCALE, LARGELY PRIVATE INVESTMENT PROJECTS:**
 - **TRANSALASKA PIPELINE - 1977 - \$8B (~\$20B NOW)**
 - **ENGLAND TO FRANCE "CHUNNEL" - 1995 - \$15B**
 - **TRANSCONTINENTAL RAILROADS - LATE 1800'S**
 - **U.S. SURFACE COMMUNICATIONS INFRASTRUCTURE - MID 1900'S**
 - **AIR TRANSPORTATION SYSTEM - MID-LATE 1900'S**
 - **SATELLITE COMMUNICATIONS INVESTMENTS - LATE 1900'S**
- **MOST OF THESE PROVIDED NEAR-TERM RETURNS ON INVESTMENT AS WELL AS INTERNAL CASH FLOWS THAT SUPPORTED EXPANSION.**
- **ALL, TO A GREATER OR LESSER DEGREE, HAD GOVERNMENT AS A DIRECT OR INDIRECT PARTNER**

ARE THERE PRECEDENTS FOR "REALLY BIG" PRIVATE SPACE INITIATIVES -2

- **NOW MUST ALSO MEET NATIONAL AND INTERNATIONAL REGULATORY REQUIREMENTS**
 - **LAUNCH LICENSES (DOT)**
 - **COMMUNICATION FREQUENCY ALLOCATIONS (FCC AND ITU)**
 - **ENVIRONMENTAL IMPACT (EPA AND INTERNATIONAL PRECEDENT)**
 - **OUTER SPACE TREATY OBLIGATIONS (DEPT. OF STATE)**
 - **OTHER TREATY OBLIGATIONS (?)**

