

## **THE ARES FUND: TO MARS ON OUR OWN NICKEL (S)**

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I have bad news, and good news, and bad news.

The bad news is that most Americans don't care whether we get to Mars or not, and they probably never will. They're not actively opposed to the idea, but they don't want to pay for it. Those of us who want to go are a minority, and always will be.

The good news is that we don't have to wait for NASA, or any other government agency (or any other government, for that matter) to pony up the funding to get us to Mars. We, the members of the Mars Society, can finance the trip for ourselves, with nothing more than the change in our pockets.

The bad news is that it will take a long time. About a hundred years, as a rough approximation.

The first of these three propositions will no doubt cause some debate. Many of you, including Bob Zubrin, are convinced that there is a vast, untapped constituency for space exploration/settlement, just waiting for another national leader with the vision of John F. Kennedy to set us back on the track we abandoned in 1972. I think there are compelling reasons to believe that this is not going to happen, but even if you don't agree, let's set this argument aside and consider the far more interesting set of propositions that follow.

The current NASA estimate for the cost of a manned Mars expedition is \$50 billion. Since NASA is subject to all the inefficiencies of any other government bureaucracy, a privately financed expedition should cost no more than half that. If we want to do it at our own expense, we have to have a \$25 billion piggy bank. That's still a lot of money – more than the probable lifetime earnings of every member of the Mars Society. But we don't need to raise the money all at once. In fact, we only need to raise one million dollars, once, and have a little (O.K., a lot) of patience.

## **THE MOST POWERFUL FORCE IN THE UNIVERSE**

When he was asked to name the most powerful force in the universe, Albert Einstein replied, "Compound interest." Given sufficient time, compound interest can magnify even small initial investments into titanic sums. Exponential growth can be thought of as a force acting on Archimedes' lever. Time is the lever arm; the longer the time, the smaller the force that need be applied to move the world (or, in our case, two worlds).

An initial investment of one million dollars needs to double about fourteen and a half times in order to reach our \$25 billion target. The time it takes to do this is determined by the rate of return – the interest rate. Just how long does it take to turn one dollar into two dollars, and two dollars into four dollars?

First, we need to establish a reasonable figure for the rate of return. This figure will be an average number, of course; unless we're invested in Certificates of Deposit, government bonds or other instruments that pay a fixed rate, the actual rate of return will vary from year to year. Bonds and CDs are safer than more speculative investments like stocks, but their rates of return are correspondingly lower. As we will see, if we rely on such instruments, it will take a lot more than a hundred years to reach our goal. The stock market, on the other hand, has been booming along for so long now at 20+% per year that many investors have come to think of this as a normal rate of return. Few financial analysts think such returns will continue indefinitely. The generally accepted 'safe' prediction is that stocks will outperform bonds, but the long-term rate of return should be estimated at around 10% per year.

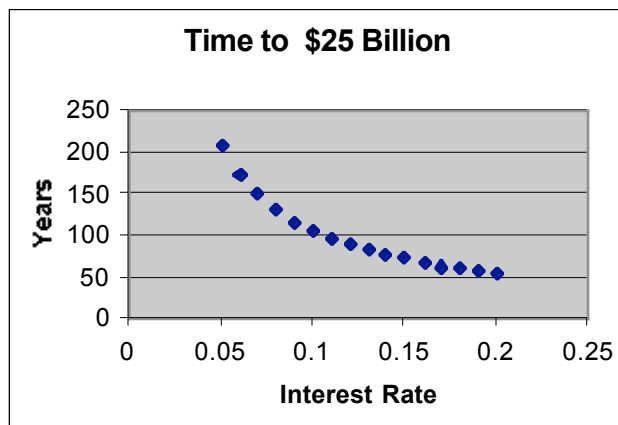
Maybe our investment counselors can beat the market, but let's be a little conservative and say they can only do as well as the projected long-term average (since inflation marches on, eroding the value of our gains, we'll allow ourselves just a little optimism and plan for an *effective* rate of return – a rate of return above the inflation rate – of 10%). To get an "exact" answer for how long we have to wait to see our nest egg hatch, we can use the following formula:

$$FV = PV(1+i)^n$$

where FV is the future value of the money, PV is the present value of the money, i is the interest rate, and n is the number of years elapsed. Every high school student would know this formula by heart, if our public education system bothered to teach even the most basic economics. But that's another soapbox. Plugging in 10% for the interest rate, \$1 million for the present value and \$25 billion for the desired future value, we find that it takes 107 years to accumulate the money we need to get to Mars on our own.

**Number of Years Required For a \$1M Investment to Reach \$25B**

Int. Rate	Years	Ending Amt.(in \$M)
0.01	1018	25070.24
0.02	512	25309.76
0.03	343	25302.77
0.04	259	25800.9
0.05	208	25549.02
0.06	174	25305.83
0.07	150	25560.34
0.08	132	25818.78
0.09	118	26081.15
0.1	107	26854.51
0.11	97	24907.43
0.12	90	26891.93
0.13	83	25439.63
0.14	77	24080.95
0.15	73	26973.81
0.16	68	24162.58
0.17	64	23115.07
0.18	61	24255.07
0.19	58	24083.73
0.2	55	22644.8



I won't pretend that these numbers aren't discouraging for those of us who want to see men on Mars within our lifetime. The important point here, though, is that we – you and I, with no help from any outside source whatsoever – have it within our power to make it happen *someday*. If we can enlist enough outside support to make it happen sooner, that is well and good. But we can make it happen *even if not one single other person on the planet cares to help us*.

Now, even a million bucks isn't chump change to a small volunteer organization like the Mars Society. But raising a million bucks – this year – should be a very achievable goal for an organization with 2,000 dedicated members.

But what if we raise two million dollars instead of one? Can we cut the time it takes to reach our \$25 billion goal in half? Unfortunately, the answer is no. We are dealing with an exponential function here, and the time it takes to reach our goal is far more dependent on the rate of return than on the size of our initial investment. (See Table 1) Doubling our seed money leaves us with thirteen and a half doublings to go; at ten percent annual growth, our money doubles in about seven years. So a two million dollar initial investment only saves us seven years in the time we have to wait. There is just no substitute for patience.

The largest living things on this planet are Sequoia trees. These giants started from tiny seeds that needed only time to grow.

## **BARRIERS TO SUCCESS**

If it's so easy to get rich, why isn't everybody a millionaire? The first answer is lack of basic financial education; our schools teach math, but not how to apply it to anything students might actually care about, like saving for retirement, or going to Mars. But there are several other potential hazards that can stunt the growth of our mighty financial tree. We'll need to keep these hazards clearly in mind if we want to protect our seedling.

*Termites.* Taxes and other fees. We'll need expert financial management, provided on a volunteer basis from within our membership if possible. However, our primary concern is to get the highest possible long-term rate of return, and if we have to pay for the expertise necessary for this, we should do so.

*Forest fires.* A major economic downturn is always a possibility. If the investment risk isn't properly spread among a number of different companies – if, for example, the entire fund is invested in real estate when the housing market turns sour – the fund could be severely damaged. In the worst case, it could be wiped out altogether. Proper management and diversified investment should provide strong roots, so that the tree can grow back even if damaged. The risk can never be eliminated completely, but there are bigger risks than this to face if we are to win the future

*Short growing season.* Even the best interest rates need time to compound. The baby boomers who waited until they were in their forties or fifties to start their retirement savings late

are learning the hard way that the later they start, the less time compound interest has to work its magic. If you're trying to grow your money from a small nest egg, there's no substitute for time.

*Premature logging.* This is perhaps the greatest danger for our organization. Once the money has grown large enough to be tempting, there will be voices from all sides presenting perfectly rational-sounding arguments as to why some of the money is needed right away. It takes more self-discipline than many people have to resist the temptation to dip into their nest egg. Those who yield to temptation will, at best, see the growth of their money stunted. As we said at the beginning, investment is a game that requires patience.

## **OTHER USES FOR THE FUND**

We may well hope that other avenues get us to Mars well before a century has passed. Our efforts to persuade the American people and their government to fund manned exploration may eventually bear fruit. New circumstances may lead another president to call America to great challenges once again. Or another country may lead the way. Certainly we shouldn't stop our efforts to make these things happen. The Ares Fund may be thought of as "Plan B," our backup plan to get to Mars if all else fails. But in the happy event that it's not needed for this purpose, it can serve another equally desirable end.

It can be a colonization fund.

If the history of space exploration to date is any guide, we may see limited scientific exploration of Mars with no immediate commitment to settlement. The Ares Fund can hasten the day of permanent settlements on Mars by paying the way of the first group of colonists and supporting their supply needs from the home planet.

It can also serve as a research fund to develop technologies and tools to lower the cost of transportation, life support, and other needs of Martian settlers. All these technologies and tools will be equally applicable to exploration and settlement throughout the solar system. In fact, science fiction readers may recognize the similarity between the Ares Fund and Robert A. Heinlein's Long-Range Foundation. In his novel *Time For the Stars*, Heinlein described a charitable trust set up by a far-sighted philanthropist to tackle large problems with little hope of immediate solution – problems which no government or corporation would be likely to tackle because of the lack of a quick payoff, but which would yield enormous benefits to mankind if they were solved. The only difference between the Ares Fund and the Long-Range Foundation is that we know our problems are soluble.

In order to allow the fund to grow to a useful size, we might place a restriction on its use as follows "No money shall be withdrawn from the fund until its value exceeds \$25 billion, or until 50 years after the first manned expedition reaches Mars. In no event shall money be withdrawn from the fund until its total value exceeds \$10 billion." It should also be noted that, after the fund reaches maturity, we might not wish to spend all of it at once. We may decide to treat it as a perpetuity, spending only the annual interest (two and a half billion a year can go a long way) and leaving the principal intact.

## **THE SOONER THE BETTER**

The realities of economics are as harsh as those of orbital mechanics. The fund will be long in the growing, so the sooner we start, the better. Every year we wait to begin pushes the date of our harvest another year into the future. But as an object in motion tends to remain in motion, once we launch the Ares Fund, we can be assured of eventual success.

The movie “Field of Dreams” has added a popular catch phrase to contemporary culture: “If you build it, they will come.” If we act now to establish the Ares Fund, we can say with conviction of our future Martian explorers and colonists:

When we build it, they will go.