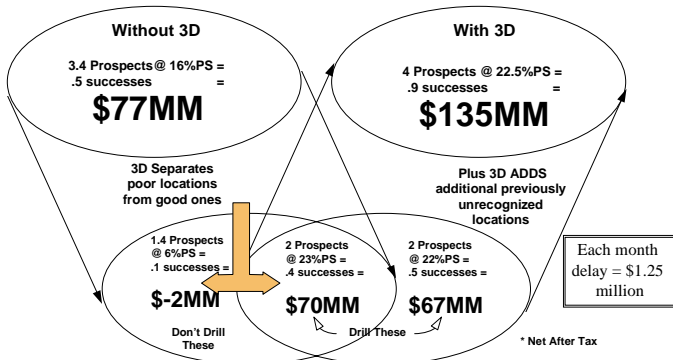


**“Maximizing technology’s value when awarding hydrocarbon exploration and development licenses”**

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When an oil company is awarded a license to search for and produce hydrocarbons from within the borders of a nation, it is the government that has a much greater stake in the outcome of that work than the oil company selected to do the work. To optimize the national wealth created by this licensing process the government must consider not only the choice of oil company licensee, but also the agreed work program to be undertaken by the licensee. Issues include: the quality of the proposed oil company work program; the oil company’s track record in exploration and development; bonus payments; license terms; tax, royalty and production sharing; and timing of the work program.



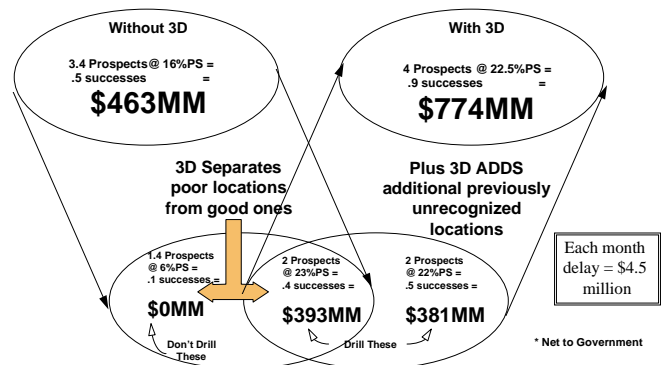
**Fig. 1 - The average exploration 3-D survey adds \$58 million of value to an oil company when applied to a typical international exploration opportunity.**

This paper focuses on two of these issues to show that the quality and timing of the application of seismic technology are high stakes issues for those in government deciding which companies to award acreage to and how to carry out the E&P work. Also it will be demonstrated how the services offered to the oil industry by SpaceData International LLP can add substantially more value to the government than to the oil companies that use these services.

D seismic grid while a second bids a work program with a regional 3-D seismic program. A study<sup>1</sup> conducted and published by Amoco shows (see figure 1) the value to the oil company of the average 2-D program is about \$77 million, and the value of the average 3-D program is \$135 million. The 3-D survey adds \$58 million through more oil fields being found and fewer dry holes being drilled. This high degree value added to the oil companies helps explain the overwhelming use of 3-D by the oil industry. However, as stated previously, the government has an even greater stake in which of these two technologies (2-D or 3-D) is used. Figure 2 shows the value of this average 2-D program and 3-D program to the government. Because of the percentage of revenues which goes to the government through royalties, taxes, and production sharing, the value to the government of the average 2-D seismic survey is \$463 million and that of an average 3-D survey is \$774 million, an increase of \$311 million per 3-D survey to the government. As this example shows, the government has a much greater stake in the outcome of the work programs bid by the oil companies than the oil companies themselves.

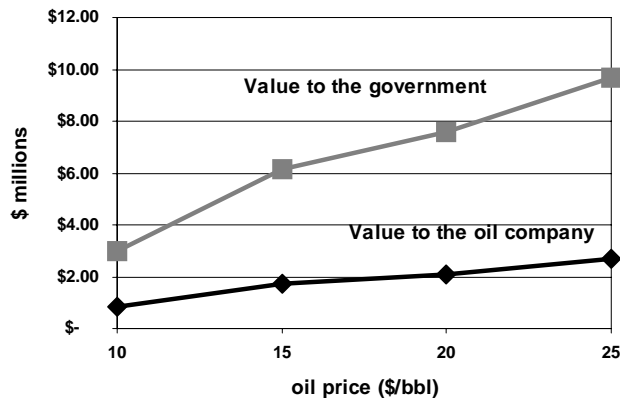
In the acreage tender process, two companies might bid different seismic work programs, one bidding a regional 2-

Since these are positive cash flows, the sooner these funds can make their way into the accounts of the oil companies and governments, the sooner they can be reinvested in new business ventures. This process, called the time value of money, is a very real issue in the efficient running of a business or government. In the case of seismic data, the sooner the data is made available to the decision makers at the oil companies, so much the sooner drilling can begin, production facilities can be built, development wells can be drilled, and the oil or gas can be produced and sold. In fact it is possible to quantify the value of delivering the 3-D data a month earlier. It has been shown<sup>1</sup> that



**Fig. 2 - Average Exploration 3-D survey value as viewed from the perspective of the host government. The host government gains \$311 million per survey.**

for each month of early delivery of an average 3-D survey, the oil company stands to gain \$1.25 million. This assessment assumes \$15 per barrel oil, a 15% reinvestment (discount) rate, and a field with 150 million barrels of reserves. The licensing government, which receives most of the revenues however, gains over \$4.5 million per month of early delivery of the data. The value of the seismic technologies used and that of early delivery of the data are highly dependent on the price of the found commodity, i.e. the price of the oil. As this value goes higher, the stakes in using the best and most timely technologies become greater as well. As is shown in figure 3, the value of a month earlier delivery when oil is \$25 per barrel is \$2.4 million per month to the oil company and \$9.9 million per month to the government.



**Figure 3 – Value of one month early delivery of 3-D seismic survey**

SpaceData Int'l LLC has developed a service, called Seismic Star, that can reduce the time needed to acquire and process seismic surveys by about 34 days. This technology delivers the daily seismic production to a headquarters processing facility as the data is acquired. This allows for full collaboration with managers and experts to optimize acquisition and processing parameters. Since the delay associated with hand carrying the data to this processing facility is removed, the final processed seismic volume is available to interpreters and managers 34 days earlier than it otherwise would have been.

Because the processed 3-D volume is the

product of a collaborative effort, employing the talents of industry experts and multiple disciplines available only at the home office, it is higher quality than the onboard processed volumes that it has replaced. In addition it is cheaper to produce because the cost of the onboard processing has been eliminated.

This service employs NASA TDRSS satellites that transmit data at a rate of 311 million bits per second from a seismic vessel or land crew to the satellite, and then to either ground facilities or other satellites until it is delivered to the onshore processing facility. These systems can be scaled to deliver virtually any quantity of daily data production, regardless of whether it is a 16 streamer 3D marine vessel or a 2D land crew. A typical marine vessel with 10 cables, dual sources and 240 channels per cable will generate 165Gbytes of data per day. Using Seismic Star's motion stabilized, 2.4m, vessel mounted dish antenna, the entire day's production can be uploaded to one of six geo-stationary TDRSS satellites in 81 minutes each day. Without transferring the data to tape media, that is by loading data directly to disk, this fully automated system then can ship the data via fiber cable to North American processing centers. If needed the data can alternately be retransmitted to other satellites, dish antennas and fiber optic networks to virtually any processing destination, arriving within a day of being acquired. The data has not been compressed and error checking for lost bits is exhaustive, using ATM transmission protocols.

	<i>Value to Oil Company</i>	<i>Value to Contractor</i>	<i>Value to Host Gov't</i>	<i>Estimated Cost</i>
<i>Per 3-D Survey</i>	\$2- 4 million	\$359 thousand	\$7.6 - \$14.8 million	\$300 - \$480 thousand
<i>Per vessel year</i>	\$12 - \$24 million	\$2.16 million	\$45 - \$89 million	\$1.8 - \$2.9 million
<i>Per Sq. Km</i>	\$667 - \$1333	\$120	\$2,520- \$4,900	\$100-\$160

**Figure 4 – Summary of Value and Costs of Seismic Star services**

These services are available at rates far below the value to be realized by both the oil companies and host government. Figure 4 has been constructed to illustrate the costs and benefits to the different stakeholders. This example uses only \$15 per barrel oil prices, 15% discount rates and assumes the data is being sent to

Houston 34 days earlier than by alternative hand-carry means. Referring to the row showing per sq. km. values, note that the benefits to the host government are 3-4 times that to the oil companies, consistent with earlier figures. Note also that the value to the seismic contractor is only approximately break-even compared to the cost of the service. This chart clearly shows that it is essential that the oil companies and, most importantly the licensing governments, must take the initiative in assuring that the satellite services that enable these value improvements are included in work programs.

Several important points have been made in this paper regarding the implementation of technology that speeds up cycle time in the oil industry. First, services, such as 3-D seismic and Seismic Star, that dramatically improve the efficiency and effectiveness of exploration and development, have been developed by the industry. Seismic Star can significantly reduce the time needed to come to a decision regarding where and whether to drill oil prospects. The government benefits the most from these services through earlier realization of revenues, followed by the oil companies and finally the service companies that benefit the least, and may not even cover the costs of the service without raising their rates. Only through the active encouragement by governmental agencies will cycle time reduction services, such as Seismic Star, be employed to the degree that is most beneficial for all the stakeholders associated with these services.

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<sup>1</sup> "The Business Impact and Value of 3-D Seismic," by W. K. Aylor, Proceedings of the Offshore Technology Conference, 6-9 May 1996, Volume 1, page 75, OTC 7960.