View from the top

- up and over the Rub Al-Khali

'Shell in the Middle East' goes to Sharourah on the southwest edge of the Rub Al-Khali (The Empty Quarter) in Saudi Arabia, then on to Shaybah in the eastern part of the desert to meet the men from Sander Geophysics who have conducted an airborne gravity survey of the South Rub Al-Khali Company Limited's (SRAK's) contract area. SRAK was formed in December 2003, with three shareholders – Shell with 40 per cent, and Saudi Aramco and Total each with 30 per cent – to explore for and develop the natural gas and associated liquids in 210,000 square kilometre contract areas in Saudi Arabia's challenging South Rub Al-Khali. 'Shell in the Middle East' also talks to Abdulmohsin Al-Dulaijan, on secondment from Saudi Aramco as Geophysical Operations Manager for SRAK, for an overview of operations in the Rub Al-Khali to date…

Abdulmohsin Al-Dulaijan Geophysical Operations Manager for the South Rub Al-Khali Company Limited

"CARRYING OUT OPERATIONS DEEP in the Rub Al-Khali requires a great deal of hard work by SRAK's managers and staff, such as Fuad Al Somali, one of our Acquisition Geophysicists who, like me, has been seconded to SRAK from Saudi Aramco. It also requires good planning and co-ordination between SRAK staff, local and national authorities and our contractors," says Abdulmohsin Al-Dulaijan, Geophysical Operations Manager of SRAK.

"I am very pleased to say that we have received a great deal of co-operation and help from both the local aviation and military authorities in Sharourah, which is the main town in the southern part of SRAK's 210,000 square kilometre contract areas.

"The authorities have provided the airborne gravity survey team from Sander Geophysics Limited [SGL], a Canadian company, with a great deal of support. Due to the nature of the survey it was deemed more appropriate for Sander's personnel to be based within the Saudi military base at Sharourah rather than in the town itself.

"This level of cooperation has been much appreciated by SRAK and its shareholders and enabled Sander to carry out the survey of the southern part of SRAK's contract area without problem.

"The second part of the airborne gravity survey was carried out in the eastern part of SRAK's contract area, around Shaybah. Saudi Aramco has a very big operation here with an airbase from which the Sander team was able to operate.

"Saudi Aramco provided Sander with the use of a hangar, accommodation and other facilities, which were most helpful and enabled the second stage of the data gathering operation to proceed very smoothly.

"HSE [Health, Safety and Environment] operating standards are a major issue for SRAK and its contractors with operations deep in the desert and far from towns and roads.

"Maher Nabulsi, SRAK's HSE Advisor, has been a regular visitor to both Sharourah and Shaybah to ensure that the various HSE interfaces between SRAK and its contractors are in place.

"Captain William Hacking, a Senior Advisor from Shell Aircraft, carried out an audit of the SGL team, its plane and equipment to ensure that everything complied with SRAK's standards. We have also received excellent support from both Saudi Aramco and Shell technical experts in HSE matters and in carrying out quality control of the acquired and processed data.

"The gravity survey has provided us with a picture of SRAK's contract area which, when combined with an existing magnetic survey, has allowed us to focus the land-based 2D seismic survey in areas which offer the greatest prospectivity for the discovery of gas reserves.

"In parallel with the airborne gravity survey we have also either been carrying out or are hoping to carry out a variety of other survey techniques. These include a land-based 2D seismic survey, Seismic Spectroscopy, Low-Frequency seismic, Magneto Tellurics and airborne gas detection surveys, all of which will enable us to develop a 3D model of the sub-surface geology.

"This, in turn, will provide us with information to enable us to select the most likely areas where gas reserves are located and in which we will then focus our initial drilling activities," concludes Abdulmohsin.

Martin Bates (centre), SGL Operations Manager and Geophysicist, with members of the SGL team in the Rub Al-Khali and, right, the onboard gravity metre with recording equipment

"SANDER GEOPHYSICS LIMITED [SGL] is a Canadian-based company which has been carrying out airborne surveys all over the world for over 40 years. Most of the surveys the company carries out are gravity, aero-magnetic and radio-metric surveys," explains Martin Bates, Operations Manager and Geophysicist, with the SGL team surveying the Rub Al-Khali for SRAK.

"SGL operates a fleet of nine aircraft and one helicopter. Our customers are mostly oil and gas and mining companies with some surveys being carried out for environmental agencies.

"Our contract here in the Rub Al-Khali was to carry out an airborne gravity survey of the entire area of SRAK's 210,000 square kilometre contract areas. For us, however, the more important figure was the line distance that we had to fly and survey, and that was around 145,000 kilometres.

"We used an onboard gravity metre with recording equipment. The gravity metre is inertially stabilised using gyroscopes. It is used to measure variations in the earth's gravity. After various processing steps, this enabled us to produce a gravity map which provided an indication of the sub-surface geology. This can then be used by SRAK for their exploration planning.

"Our operations started in Sharourah, in the south of the Rub Al-Khali, and we have now completed the survey in Shaybah in the eastern part of SRAK's contract area.

"SGL had a team of 14 here in

MARTIN BATES CONTINUED

Saudi Arabia, made up of seven pilots, four geophysicists, one electronics technician and an onsite maintenance engineer and apprentice to look after the three Cessna Caravan aircraft we were using.

"Setting up operations in Saudi Arabia was not an easy task as the Kingdom does not have what we call general aviation activities outside of military and commercial airline operations.

"It has therefore been essential to coordinate operations very closely all along the line with the Saudi authorities to make sure that everything proceeded smoothly.

"Neither Sharourah nor Shaybah have been unpleasant places from which to operate. In both locations we have been well accommodated, and at Shaybah we have been provided with an excellent aircraft hangar.

"This has been an interesting operation for all of us, working deep in one of the world's biggest and remotest deserts. It has afforded us the opportunity to work in a most unusual environment and to come away with an appreciation of an entirely different way of life," Martin concludes.

"IN AN OPERATION SUCH AS THE EXPLORATION FOR GAS in the Rub Al-Khali, HSE [Health, Safety and Environment] is obviously a major issue," says Maher Nabulsi, SRAK's HSE & Sustainable Development Advisor.

"We have had over 500 people carrying out land-based seismic surveys in the heart of the Rub Al-Khali, several hundred kilometres from the nearest town or road.

"The airborne gravity survey used three aircraft which were also flying over SRAK's 210,000 square kilometre contract areas. So we had to be prepared for every eventuality.

Maher Nabulsi, SRAK's HSE Advisor

"Since the SRAK shareholders have agreed that during the first exploration phase of the joint venture Shell standards and procedures will be adopted, SRAK has also done this in the area of HSE. Hence SRAK has a set of policies, procedures, standards and commitments in place which are compatible with those of Shell and which reflect the extensive experience of Saudi Aramco. As part of SRAK's HSE commitments an Environmental Impact Assessment of SRAK's contract area was carried out prior to the execution of any operations. All the resulting recommendations will be dealt with to ensure that SRAK and its contractors 'walk the talk' and take good care of the environment.

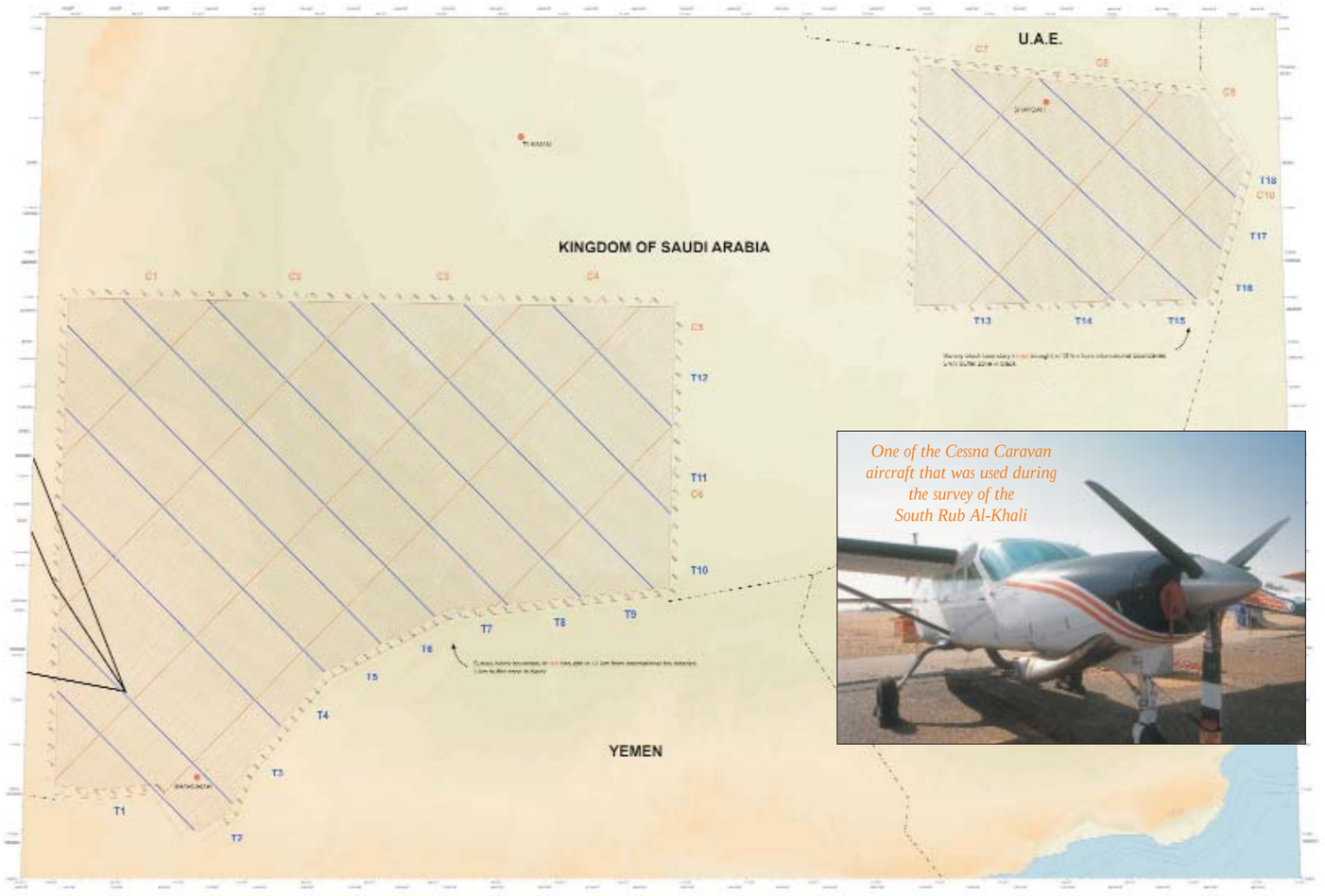
"When it comes to any airborne operations carried out on behalf of SRAK, airworthiness of the aircraft and compliance with the best practices in aircraft operations and HSE management are essential. SRAK required a pre-operational start up audit to be carried out on the aircraft and the contractor requested that Captain William Hacking of Shell Aircraft should execute this on its behalf.

"My responsibilities lie in ensuring that the contractor has a proper HSE management system in place on behalf of the Geophysical Operations Department and that there is an appropriate interface document between the contractor's and the Company's HSE Management Systems. For example, SRAK and SGL considered what the appropriate response was to be in case one of the aircraft was forced to land unexpectedly in the desert.

"SRAK also had a seismic acquisition programme ongoing in the Rub Al-Khali at the same time as the airborne gravity survey. SRAK awarded the contract for Air Transport Services for the purposes of Medevac [Medical Evacuation] to a local contractor.

"For a variety of reasons this contractor was unable to mobilise its aircraft in the short term and SRAK put in place an alternative solution through an arrangement with the emergency Medevac services run by the Saudi Arabian military. SRAK also investigated the possibility of using the SGL aircraft as a back-up emergency airborne medical emergency evacuation option.

"To this end SRAK, together with its two contractors SGL and WesternGeco, physically tested the viability of such a solution and ensured the emplacement of an interface document between the relevant parties to cater for such an eventuality," Maher concludes.



Flight plan for South Rub Al-Khali Company Ltd airborne survey

One of the Cessna Caravan aircraft that was used during the survey of the South Rub Al-Khali

CAPTAIN WILLIAM HACKING, Shell Aircraft Senior Advisor, says, "As SRAK adopted Shell standards, processes and procedures, I was assigned to carry out an operational and technical audit of the aircraft and operations of SGL. The purpose of this audit was to ensure SGL's compliance with the terms of the Aircraft Service Agreement with SRAK.

"What I looked for in the audit related to such things as the company's

CAPTAIN WILLIAM HACKING CONTINUED

◀· safety management system, which in the case of SGL is satisfactory. Indeed, I was pleased to report that the company has not had any aircraft accidents in its 40 years of operations.

"Other things I looked at included quality assurance procedures in engineering and operations, the training the pilots receive, maintenance records, support and procedures specific to this survey operation and the flight following procedures with the use of radio and satellite equipment. Search and rescue operations are also an important part of any operation, particularly in such a remote area as the Rub Al-Khali.

"I reported to SRAK on my findings with recommendations for action by the operator. My overall opinion was that there were no reasons whatsoever to make any recommendations that would prevent operations from proceeding," Captain Hacking concludes.

"AS WELL AS LEADING SGL'S TEAM OF PILOTS I am the captain of one of the planes," says Todd Svarckopf, Chief Field Pilot for SGL's operations in the Rub Al-Khali.

"As SGL is a Canadian-based company it was a logistical challenge to deliver the three planes to the southern edge of the Rub Al-Khali. One plane was flown in from Canada, whilst the other two were brought in from North Africa.

"Our contract with SRAK called for us to fly 145,000 kilometres to gather the required data. We did this by flying 600 metres above ground level at a speed of 110 knots. We used Cessna Caravan aircraft which are single-engine turboprop aircraft.

Captain William Hacking, Shell Aircraft Senior Advisor, and members of the SGL team

"SRAK provided us with a grid to fly over the designated area. This grid consisted of lines on a northeast/southwest orientation, two kilometres apart. Each line was an average of 600 kilometres long, which was about three hours' flying time.

"We were restricted to seven hours flying along the grid lines to collect data for the gravity survey and to a total of 10 hours flying a day. The flying was not difficult as, despite the dunes which are quite high, the terrain is fairly smooth, but we did have challenges with the heat which rose to over 50 degrees centigrade during the survey.

Todd Svarckopf, Chief Field Pilot for SGL's operations in the Rub Al-Khali

"To counter this, we flew out every day one hour before sun up and starting production flying as the sun was breaking on the horizon to take advantage of the coolest part of the day.

"The planes are fitted with an ILS [Instrument Landing Slope], which was modified to provide us with guidance on our preferred line of flight in terms of both height above ground level and with regard to lateral deviation.

"It took a great deal of concentration to fly the lines with accuracy. For this reason we flew the planes with two pilots with 30 minute rotations," Todd concludes. S