



Statement of International Capabilities

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Company Overview

C & C Technologies, Inc. is an international surveying and mapping company headquartered in Lafayette, Louisiana. C & C has approximately 600 employees worldwide. The company performs services for the oil and gas industry, the telecommunications industry and the U.S. government. C & C owns a vast array of assets, including land and underwater positioning equipment, high-resolution geophysical equipment and vessels, geotechnical field and laboratory equipment and office processing and reporting software. The company is privately owned and was established in 1992.

Range of Services

C & C provides a wide range of surveying, mapping and related services, which are summarized in this document. The company has several major divisions.

C & C's **C-Nav Worldwide DGNS Services Division** provides C-Nav offers real time decimeter horizontal accuracy and is provided to clients involved with 3D exploration seismic, hydrographic, mining, geophysical, geotechnical and other projects requiring the most accurate positioning equipment available.

The **Geophysical and Geosciences Survey Division** collects, processes and interprets high-resolution geophysical data in support of the installation and maintenance of offshore assets. C & C leads the world with its state-of-the-art autonomous underwater vehicles, which provide unparalleled seabed geophysical data.

The **Geotechnical Division**, headquartered in Houston, Texas, offers geotechnical engineering, a geotechnical lab that performs standard and dynamic testing, jumbo piston coring and rotary boring services. This division has also played a major role in many joint industry projects.

The **Government Services Division** provides services to governments, academic institutions, and the U.S. military. Example projects include Law of the Sea surveys, hydrographic charting and Gulf of Mexico hurricane debris mapping for the National Oceanographic and Atmospheric Administration.

The **Land and Transition Zone Division** performs a variety of surveying and mapping projects. Crews operate on land and coastal areas including swamps, marshes, inland waterways, bays and nearshore offshore areas. The professional office staff generates maps, charts, plats and reports as needed.

The **Marine Construction Survey Division** has extensive experience supporting projects in shallow, deep and ultra deep water. Capabilities include surface and underwater positioning with state-of-the-art equipment and experienced field crews. The office staff has extensive project management experience.

Company overview

The **Unmanned Systems Division** has recently co-developed its new Unmanned Semi Submersible, which provides an extended survey presence over areas not suited to a manned launch.

The **West Coast Division** provides geoscience services and special projects along the west coast of North America, in Alaska, and worldwide. Services include hydrographic services, geophysical services, soils engineering services, and physical oceanographic projects.

C & C's operations are sustained by several in-house support functions, including a database department, a systems development department, an information technology department an electronics department, a mechanical fabrication department, and a health, safety, environmental and quality assurance function. C & C's main facility includes more than 45,000 square feet of office, laboratory and warehouse space, and is staffed 24 hours a day, seven days a week.

Geographic areas served

C & C's geographic location is well suited to serve the needs of clients positioned in the Gulf of Mexico area. The company has conducted North American marine operations offshore the Pacific and Atlantic coasts of the U.S. and Canada. C & C has completed projects in the Caribbean Islands and most countries of Central and South America. AUV operations have been conducted offshore for many of the deepwater plays in West Africa and routing alignments connecting the continents of Europe and North Africa have been investigated across the Mediterranean Sea. Southeast Asia is another area where C & C survey crews have embarked, with operations taking place offshore in the South China Sea, Yellow Sea, Philippine Sea and Indian Ocean. Besides its corporate office located in Lafayette, Louisiana, C & C has offices in Bothell, Washington; Houston, Texas; Stonewall, Louisiana; Angola; Brazil; Mexico; Singapore; South Africa and the United Kingdom.

Sample Client List

C & C's oil and gas client list includes most of the major operators such as BP, Shell, Total, Woodside, Petrobras, Exxon Mobil, Chevron, BHP and Williams, as well as many independents. The U.S. Army Corp of Engineers, NOAA, USGS, U.S. Navy, Naval Research Lab and Environmental Protection Agency have all awarded survey contracts to C & C. Cable route surveys have been award to C & C by Tyco, Alcatel, Global Marine, AT&T and Global Crossing.

Financial Summary

C & C is a financially sound company. The company has completed many multi-million dollar contracts.

Company History

Thomas and Jimmy Chance founded C & C in 1992 after the sale of their father's company, John E. Chance and Associates. Well funded from the sale, the brothers set out to start a small company specializing in multibeam bathymetry surveys. With the Chance

Company overview

name synonymous with survey quality, clients began asking the company to perform more and more surveys outside the scope of multibeam surveys. The company has grown to nearly 600 employees, with specialists in fields such as land survey, geodesy, geophysics, hydrography, geology, computer science, electrical engineering, geotechnical engineering and civil engineering. Milestone events in the company's history include surveying of the Panama Canal, the award of a Navy contract for controlling an ORCA UUV, the award of the Pan-Am telecommunication cable route survey, commissioning of the first commercial deepwater survey autonomous underwater vehicle and the release of C-Nav, a globally-corrected GNSS system capable of decimeter horizontal accuracy.

C-Nav DGNSS Services Division

The C-Nav Division provides globally-corrected positioning services for the hydrographic, offshore oil field exploration, survey and construction industries. The C-Nav Precise Point Positioning provides the marine sector with the most accurate, reliable and integrity-independent GNSS system in the world. C-Nav is an inherently robust system, providing users with worldwide 10-centimeter accuracy and 200 percent redundancy. C-Nav is a state-of-the-art system with excellent accuracy and reliability, yet is simple to operate and competitively priced. C-Nav receivers can be licensed to operate using NET-1 or NET-2 correction signals, either individually or with both networks to provide maximum reliability and technical redundancy. Vessels can be equipped with two separate C-Nav positioning systems: one dedicated to NET-1 and the other to NET-2, providing two independent delivery solutions.

Real-Time GIPSY®

C-Nav-enhanced RTG solution eliminates inherent errors and limitations associated with traditional GPS reference stations. Operating at the fundamental GNSS level, each GNSS satellite error source is evaluated independently — a major advance beyond earlier GNSS ground-based augmentation systems. The C-Nav ground infrastructure includes a global network of satellite tracking and system-monitoring sites providing a quality controlled feedback loop. Two dedicated and independent Processing Centers each employ an advanced proprietary version of the Jet Propulsion Laboratory's Real-Time GIPSY® software. The Processing Centers ensure that the six fully redundant L-band hi-power communication satellites distribute validated correction data to C-Nav's worldwide user community. The solution has four segments: ground, control, space and user.

Ground Segment

The C-Nav ground network is comprised of reference/monitor stations equipped with two dual-frequency GPS receivers. The observations from both receivers are transmitted to the two Processing Centers. Selected stations within the network are additionally equipped with dual-frequency user hardware to monitor the L-Band signal strength to measure and compare real-time position, accuracy and precision. The number of GNSS receivers at each ground station, compounded by the number of simultaneous observations from each GNSS satellite by the station network (typically better than seven) and augmented by the JPL ground network provides an unprecedented level of over-capacity and system robustness. Each C-Nav station is located within a secure facility, with secure communication data links to the control segment and backed up by VSAT or ISDN and uninterruptible power supplies. Each GNSS satellite is tracked by multiple reference/monitor stations and can maintain P3 precision, even with a number of stations out of commission (an event that has never happened).

Control Segment

The control segment is comprised of two independent Processing Centers, each fitted with dual sets of processing hardware. One center is located in Torrance, California and the other is in Moline, Illinois. The Processing Centers are interconnected by high-speed frame-relay feeds and receive the full complement of reference station data. Each

C-Nav DGNSS Services

Processing Center makes an independent selection between Receiver A and Receiver B, producing independent sets of RTG correction values for each GPS SV. After the Processing Centers exchange and compare correctors for validation, each sends its correctors independently to the Land Earth Stations for uplink to the NET-1 and NET-2 communication satellite constellations. Data flow between the Control Centers and the Land Earth Stations is via secure high-speed cable and VSAT with ISDN backups.

Space Segment

The C-Nav space segment consists of six geostationary communication satellites providing redundant Hi-power L-Band distribution between approximately 75° north and 75° south latitudes. The six communication satellites are constantly monitored by the Processing Centers to ensure service continuity. Additionally, various ground stations monitor the received L-Band signal strength to confirm satellite transmission signal levels, veracity, and precision of received data. The satellite constellation is up-linked through six Land Earth Stations configured as NET-1 and NET-2.

User Segment Receiver Technology

C-Nav3050

The C-Nav3050 integrated C-Nav/RTK Extend Receiver provides decimeter-level position accuracy, anywhere in the world, anytime. Powered by the new Sapphire GNSS Engine, the C-Nav3050 provides 66-channel tracking, including multi-constellation support for GPS, GLONASS and Galileo. It also provides patented interference rejection and anti-jamming capabilities. The C-Nav3050 is fully upgradeable, allowing users to go from a single-frequency receiver, to multi-frequency with a simple software upgrade. The flexibility of the C-Nav3050 will enable you to adapt to any application, and will give you the confidence to get the job done.

C-Nav2050

At the heart of every C-Nav2050 dual-frequency receiver is the Touchstone-4 ASIC. This 26-channel dual-frequency receiver is integrated with a proprietary L-Band receiver and tri-band antenna. C-Nav2050 dual-frequency receivers measure the ionospheric delay for each satellite while the tropospheric zenith delays are calculated from a multistate time and position model aided by redundant satellite observables. Typically a C-Nav2050 dual-frequency receiver operating on NET-1 or NET-2 will provide better than 10 cm horizontal and 15 cm vertical accuracy. Unlike DGNSS positions that are relative to reference station locations, C-Nav produces absolute ITRF 2005 positions, within geostationary satellite visibility, anywhere, any time.

C-Nav1010

The C-Nav1010 L1 receiver integrates the C-Nav correctors in addition to WAAS/EGNOS data. The C-Nav1010 is a tightly integrated package designed to maximize precision and stability in noisy and hostile environments. Offering sub-meter accuracy worldwide, and at a lower cost than the high-performance 2050, the 1010 is a rugged and reliable unit designed for maximum productivity with minimal setup time.

C-Nav DGNSS Services

C-NaviGator

The C-NaviGator is a self-contained, control-display unit that provides visual aids to monitor the quality, performance and accuracy of GNSS position information for any GPS receiver. It displays real-time system and quality information, has multiple NMEA inputs/selectable outputs, a touch screen display, on screen help, four built-in serial and two USB ports, and is intuitive, rugged and reliable.

C-Monitor

C-Monitor is a 32-bit MS Windows application intended for use as a graphical aid to evaluate the performance and reliability of a GNSS system. The C-Monitor utility provides the user with a graphical representation of the numerical information supplied by generic GPS receiver equipment as received in the format of the NMEA ASCII messages over an RS-232 serial port. There are no navigation calculations performed by this utility. The C-Monitor system provides a graphical display of the information received from any valid NMEA input message. The information enables the user to easily recognize a decrease in reliability of any attribute or measurement of each input device. Additionally, C-Monitor allows user defined alarm settings or limits to be preset by the user.

C-Scape

C-Scape is a Windows application designed to provide independent real-time monitoring of any Dynamic Positioning System giving the user unprecedented positioning confidence and situational awareness at sea.

Features include the following:

- Blends multiple sensor inputs for unparalleled position QA/QC
- Fully compatible with the C-Nav3050 DGNSS receiver, the latest in positioning technology
- Suitable for most dynamically positioned vessels including drilling rigs and drilling ships
- Intuitive, easy-to-use interface
- Compatible with AutoCAD DXF object and MMS data file overlays

Geophysical acquisition and geosciences division

C & C's vessels are outfitted with the most technologically advanced acquisition systems for the collection of high-resolution geophysical data. The vessels are equipped with a number of different geophysical systems, allowing flexibility in choosing the right tools for the survey objective. The crews are experienced and well trained in health, safety and environmental issues. Professional geoscientists and archaeologists interpreting on computer workstations assure the geophysical data is presented accurately and efficiently. Geoscientists and archaeologists are keenly familiar with Minerals Management Service guidelines and have interpreted data sets from many of the offshore oil producing provinces around the world.

Survey Vessels

C & C has several vessels on contract in addition to the vessels owned by C & C. All of the larger vessels are equipped with satellite communications to allow for data and preliminary maps to be transferred to a secure website for clients to easily view the progress on their project from any computer with internet access.

M/V Andrew Charles

The M/V Andrew Charles is a 34-foot vessel operated by C & C. It is used to perform geophysical surveys using single beam bathymetry, side scan sonar, magnetometer, subbottom profiler, and ProSAS equipment.

R/V C-Ghost

The C-Wolf is a 30-foot aluminum hull vessel (2007) owned and operated by C & C. It is used to perform inland and coastal survey projects using single beam bathymetry, side scan sonar, magnetometer and subbottom profiler equipment. The vessel drafts two feet and is 8.5 feet wide.

M/V C-Lion

The M/V C-Lion is a 35-foot vessel owned by C & C that is used to perform inland and coastal survey projects using single-beam bathymetry, side scan sonar, magnetometer, electronic depth of cover system and subbottom profiler equipment.

R/V C-Wolf

The C-Wolf is a 30-foot aluminum hull vessel (2007) owned and operated by C & C. It is used to perform inland and coastal survey projects using multibeam bathymetry, side scan sonar, magnetometer and subbottom profiler equipment. The vessel drafts two feet and is 8.5 feet wide.

R/V Coastal Surveyor II

The R/V Coastal Surveyor II is a 40-foot vessel owned by C & C that is used to perform inland and coastal survey projects using multibeam bathymetry, side scan sonar, magnetometer and subbottom profiler equipment.

R/V Hydro Surveyor

The R/V Hydro Surveyor is a 26-foot vessel owned by C & C that is used to perform inland and coastal survey projects using a single beam echosounder, side scan sonar and magnetometer equipment.

Geophysical and Geosciences Services

M/V Inez McCall

The Inez McCall is a 108-foot steel hull vessel (1982) operated by C & C to perform coastal survey projects using multibeam bathymetry, side scan sonar, magnetometer and subbottom profiler equipment. The vessel drafts eight feet and is 24 feet wide. The draft of the vessel limits its use to no less than four meters of water.

R/V Inland Surveyor

The R/V Inland Surveyor is a 24-foot vessel owned by C & C that is used to perform inland and coastal survey projects using multibeam bathymetry, side scan sonar, magnetometer and subbottom profiler equipment.

M/V Miss Ginger

The M/V Miss Ginger is a 180-foot vessel with accommodations for 27 personnel operated by C & C since May 2008 as a C-Surveyor AUV support vessel.

R/V Northern Resolution

The R/V Northern Resolution is a 247-foot Norwegian flagged vessel owned by C & C to assist in the acquisition of geophysical and geotechnical data. The vessel has accommodations for 50 passengers for 50 days duration. The vessel is usually mobilized in the Gulf of Mexico, West Africa or Brazil for deepwater AUV surveys. When not performing AUV surveys, the Northern Resolution performs conventional shallow and deepwater surveys, in addition to collecting geotechnical soil samples.

R/V Ocean Surveyor

The R/V Ocean Surveyor is a 106-foot U.S. flagged vessel owned by C & C. The vessel has accommodations for 12 passengers for 14 days duration. Normally this vessel performs conventional hazard or pipeline surveys in the Gulf of Mexico using multibeam bathymetry, side scan sonar, magnetometer, subbottom profiler and soil sampling equipment.

R/V Rig Supporter

The R/V Rig Supporter is a 245-foot Norwegian vessel on long-term contract to C & C to assist in the acquisition of geophysical and geotechnical data. The vessel is in immaculate condition and has accommodations for 52 passengers for 39 days duration. The vessel is usually mobilized in the Gulf of Mexico, West Africa or Brazil for deepwater AUV surveys. When not performing AUV surveys, the Rig Supporter performs conventional shallow and deepwater surveys, in addition to collecting geotechnical soil samples.

Geographic Information System

C & C began its comprehensive internal Geographic Information System (GIS) in 1994 by integrating historical as-built information from the Minerals Management Service with other available plats, maps and sources. Since that time, C & C has dedicated substantial resources and technologies to continuously update, maintain and improve its GIS capabilities. Data from C & C's geohazard and as-built surveys, information from surveys performed by other companies, client-provided data and public information sources are imported on a daily basis to keep the GIS

Geophysical and Geosciences Services

current. The information contained in the GIS has proven to be vital and dependable in successfully planning and executing many projects for C & C clients.

Pipeline Hazard Surveys

Minerals Management Service NTL No. 98-20 (Shallow Hazards Requirement) provides guidelines on field acquisition and reporting requirements for proposed right-of-way pipelines for the Gulf of Mexico OCS region. C & C routinely conducts these types of surveys with quick turn around times on fieldwork and reporting. Engineering and hazard reports, permit plats and MMS-formatted digital alignments are normally included as deliverables.

Block Study Hazard Surveys

Hazard surveys complying with Minerals Management Service NTL No. 98-20 (Shallow Hazards Requirement) for offshore leases must be performed before drilling an exploration well in a lease block. C & C's vessels are equipped to conduct these surveys using a fathometer, pinger, side scan sonar, magnetometer and air gun with either a single-channel or multi-channel seismic streamer for intermediate depth seismic. Timely hazard reports and hardcopy data are delivered to the client to expedite permitting requirements.

Archaeological Surveys

The Minerals Management Service NTL No. 2002-G01 (Archaeological Resource Surveys and Reports) provides survey and reporting guidelines for Gulf of Mexico leases or proposed right-of-way pipelines falling within those designated areas requiring historic and/or prehistoric archaeological assessments. C & C's geophysical vessels collect MMS-compliant archaeological data for reporting by staff archaeologists.

Site-Specific Archaeological and/or Hazard Surveys

A site-specific archaeological and hazard survey is the minimum amount of area required by the MMS to permit a well location. The area must measure 1,800 by 1,800 meters at a minimum. All other requirements are as specified in NTL No. 98-20 and NTL No. 2002-G01.

Deepwater Archaeological Assessments (Historic)

The Minerals Management Service (MMS) has designated several multi-block areas offshore as having a high potential for holding deepwater historic shipwrecks. C & C's staff archaeologists specialize in the deepwater archaeology field and can generate MMS-compliant reports to satisfy permit requirements.

Terrestrial Phase I Archaeological Surveys

Archaeological surveys must be performed on projects using federal resources as outlined in Section 106 of the National Historic Preservation Act, as amended (16 U.S.C. 470 et. seq.) or as required by State Historic Preservation Laws. C & C staff archaeologists provide Section 106-compliant Phase I Reconnaissance Surveys and Reporting for terrestrial projects that fall under these laws. C & C staff archaeologists are currently authorized to conduct terrestrial archaeological assessments in Alabama, Louisiana and Florida. Authorizations to conduct work in other states or countries are obtained on a case-by-case basis.

Geophysical and Geosciences Services

3D Exploration Seismic

Geohazard Reports Minerals Management Service NTL No. 98-20 requires a shallow hazard assessment for exploration wells in the Gulf of Mexico. Deepwater leases (greater than 300 meters) can be exempted on a case-by-case basis from these requirements in lieu of a survey report generated from 3D exploration seismic data. C & C maintains several seismic workstations and a well-trained staff to generate geohazard assessments from 3D exploration seismic data. These geohazard reports can also be of great benefit to overseas drilling programs.

Integrated Geophysical and Geotechnical Studies

C & C geoscientists work closely with their geotechnical specialists to produce seamless reports, tying the geophysics to the geotechnics. This combination results in reduced reporting time and assures proper correlation between the geophysical interpretation and physical soil measurements.

Exploration Plan or Development Operations Coordination Documents

Minerals Management Service NTL 98-20 requires an assessment of geohazards wherever proposed platforms or drilling rigs will cause bottom disturbing activities. Document submission requires two copies of the hazards data for the two tracklines nearest the proposed platform or well locations along with a geohazard letter and permit plat.

Shallow Water Flow Assessments

Shallow water flow can be a problem when drilling in the deepwater of the Gulf of Mexico. C & C's geoscientists can identify stratigraphic zones where shallow water flow conditions could exist on 3D exploration or high-resolution 2D seismic data. Stratigraphic correlation to well or drilling logs can also be made.

Lease Term Pipeline Letters

Existing geophysical hazard data from block studies or other sources can be used to permit lease-term pipelines or flowlines. C & C's geosciences staff can create the hazard assessment letters and permit plats needed for permitting lease term systems.

Autonomous Underwater Vehicle Surveys

C & C Technologies, Inc. pioneered the world's first commercially operated Autonomous Underwater Vehicle (AUV) for oil and gas exploration. Now the company leads the market with its four AUVs. As frontrunners in the fields of AUV technology and deepwater mapping, C & C professionals have an unmatched depth of talent and experience. With C & C's surveying experience spanning the world four times over, it sets the standard in deepwater AUV capability with more than 200,000 kilometers of survey experience for more than 62 clients. AUV data is processed onboard and charts are transferred via satellite to a secure website for the fastest possible turnaround of client data. C & C currently has a fleet of four AUVs. Each AUV has the following equipment installed:

- Kongsberg Simrad EM 2000 Multibeam Bathymetry System - 111 beams
- Seabird Electronics SBE 49 FastCAT CTD with Digiquartz Depth Sensor
- Payload - UltraSparc 650 mHz cPCI with 1 gigabyte ram
- RDI Navigator DVL - WHN300 - 300 kHz

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- Kongsberg Simrad HiPAP Ultra Short Base Line (USBL) Acoustic Positioning System
- Link Quest Acoustic Data Modem
- IMU90 Motion Reference Unit

Deep Tow System Surveys

C & C owns and operates several deep-tow systems capable of collecting side scan sonar, magnetometer and subbottom data between depths of 300 and 3,000 meters. These systems are generally employed on telecommunication cable route surveys. These systems are being phased out and replaced by AUV technology.

Telecommunication Cable Route Surveys

Telecommunication cables can span the oceans and require special and complex survey considerations. C & C has experience in complying with these survey specifications including landing site, diver swim, small boat, continental shelf/upper slope and full-ocean depth surveys. Onboard interpretation by qualified professional geoscientists results in detailed final reports and Route Position Lists that minimize cable manufacturing and installation costs.

Landing Site Surveys

Landing site surveys are topographical surveys conducted at the site of a cable or pipeline landing. All visual features within proximity to the landing location are identified and mapped, along with elevation data. A survey monument or benchmark is usually identified for future survey control of the construction operations.

Diver Swim Surveys

Diver swim surveys are routinely conducted where telecommunication cables or pipelines come ashore. Divers usually walk and/or swim several transects parallel to the route seaward to a depth of about three meters from the shoreline landing point. Notes are generated for mapping purposes on the bottom conditions within the surf zone.

Small Boat Surveys

These surveys for telecommunication or pipeline routes are usually carried out between the water depths of safe operational limits and 15 meters of water depth. Single beam echosounder, side scan sonar, subbottom bathymetry and magnetometer data are generally collected only during daylight operations on these small vessels of opportunity.

Continental Shelf/Upper Slope Surveys

These surveys are typically conducted for telecommunication surveys on the continental shelf and upper slope using conventional geophysical survey equipment with crews operating 24 hours a day. These surveys are conducted in water depths ranging from about 15 to 1,500 meters.

Full Ocean Depth Surveys

Telecommunication routes crossing the mid to lower continental slope and abyssal plain are generally surveyed with multibeam bathymetry systems only. Map scales are generally on the order of 1:100,000 and any unusual topography or steep slopes are avoided by the alignment.

Geophysical and Geosciences Services

PROSAS™ Surveyor SAS Sonar

The PROSAS system produces high definition, photographic-quality, real-time acoustic imagery across the entire transmission range precluding the typical necessity to run many perpendicular survey lines. This enables C & C to complete a faster, more cost-effective pipeline inspection survey and reduces the amount of time required for geologists to interpret images.

Side Scan Sonar Surveys

These systems produce a plan view image of the seabed from which specialized interpreters can identify any obstructions or seafloor disturbances. Exposed pipelines, cables, anchor scars, reefs, banks, fault scarps and rock outcroppings are just a few of the features identifiable with these systems. Low (~100 kHz) and high (~500 kHz) frequency systems can be used depending on the resolution needed.

High-Speed Side Scan Sonar Surveys

The United States military was instrumental in developing multiple-beam side scan sonar capable of producing high-resolution imagery at survey speeds approaching 10 knots. C & C generally employs this technology on NOAA hydrographic surveys.

Single Beam Echosounder Surveys

Single beam echosounders produce narrow beam widths and can provide very accurate water depths. Heave compensation to remove wave action, tide corrections and water column velocity corrections are generally applied to the collected soundings.

Multibeam Bathymetry Surveys

Multibeam bathymetry systems saturate the bottom with numerous beams to produce a grid of soundings detailing the bottom topography. Water depth generally dictates the proper system frequency to use. Installation is critical to the proper operation of the system and extremely accurate heave, pitch and roll sensors need to be employed, along with precise positioning to obtain desirable results. C & C employees consider themselves experts in the collection and processing of multibeam bathymetry data, having embraced this technology since its infancy.

3D Visualization Techniques

Multibeam bathymetry systems generate extremely large volume data sets that require special software for viewing. C & C uses IVS Fledermaus software which allows the interpreters, hydrographers and clients to get the most understanding out of their multibeam bathymetry or other large volume data sets. Side scan sonar imagery, route alignments and geographical boundaries are easily draped over the seabed imagery.

Marine Magnetometer Surveys

Magnetometer surveys are run to locate buried pipelines or to identify locations where ferrous debris may be exposed or buried below the seabed. These data are recorded digitally and the results of the interpretation are included in tables and depicted on the study maps. C & C can operate and position these systems in water depths down to 3,000 meters.

Geophysical and Geosciences Services

Intermediate Depth Single-Channel (Analog) Seismic Surveys

Minerals Management Service guidelines stipulate single channel, intermediate depth penetrating seismic data must be collected for permitting exploration or development wells. C & C routinely collects these single channel data digitally and performs the hazard interpretation on seismic workstations. Record lengths to two seconds below the seabed are generally recorded with a 90 cu.in. air gun used as a source.

Intermediate Depth Multi-Channel (Digital) Seismic Surveys

C & C recently invested in state-of-the-art digital seismic cables and multichannel recording equipment. Electronic circuitry converts the analog seismic signals at the hydrophones to digital output, thereby reducing noise inherent in analog cables. Typical recordings are of 16, 24, 48 or 96 channels with hydrophone group intervals of 6.25, 12.5 or 25 meters. A 90 cu.in. air gun is typically used as the seismic source, although smaller or larger gun sources are available to meet the client's needs.

Foundation Zone Surveys

High-resolution, high frequency seismic data are needed for imaging sediments beneath proposed platform templates. Small air guns or waterguns coupled with C & C's 6.25-meter group digital cables can be used to acquire these high-frequency data. The seismic data are typically correlated to geotechnical borings and provide assurances of no lateral variations in soil conditions.

Piston/Drop Coring

A coring device is used to obtain sediment samples in water depths between five and 3,000 meters. The location of the cores can be either predetermined or designated in the field where anomalous areas are highlighted by the seismic and side scan sonar systems. Core samples from deeper depths are available upon special request.

Pipeline Inspection Surveys

Marine magnetometers can be used to check the position of existing buried pipelines, expediting costly construction operations at foreign crossings. Side scan sonar can be also be used as a check for exposed or damaged pipeline. Pipeline as-found locations can be derived from sonar for those pipelines exposed on the seabed.

Anchor Scar Investigation Surveys

Side scan sonar and multibeam bathymetry systems are useful in determining anchor mooring positions and drag scar locations from recent seabed impacts typically associated with oil and gas activities. This information can be useful in mitigating potential damage to hardground or other environmentally sensitive areas from such activities.

Pre-Well Site Clearance Surveys

Pre-well clearance surveys are generally performed with 360° scanning sonar to ensure the proposed drill site is free from any obstructions that could hinder drilling operations. Conventional sonar and/or magnetometer data collected from a survey ship can also be used to clear the location.

Post-Well Site Clearance Surveys

Minerals Management Service NTL 98-26 [Minimum Interim Requirements for Site Clearance (and Verification) of Abandoned Oil and Gas Structure in the Gulf of Mexico] requires a post-well site clearance survey be conducted to clear the well site of any debris lost from the platform during drilling operations. C & C personnel can conduct these surveys with scanning or conventional surveying and provide a clearance letter in compliance with the MMS guidelines.

Sand Search Surveys

Subbottom profilers are used in locating and determining thickness of near-seafloor sand deposits for beach renourishment or similar projects. These data are interpreted on seismic workstations and volume calculations of the mapped sand resource can be calculated. Sub-seafloor sediment maps or isopach maps of the sand deposits are generally created.

Seabed/Bottom Search Surveys

Storms or other unfortunate incidents can result in lost tools or platform debris that need to be located, recovered or cleared as a potential hazard to navigation or seabed obstruction. Multibeam bathymetry or side scan sonar systems are used in pinpointing the locations of these lost items.

Burial Assessment Surveys

Pipelines, flowlines and telecommunication cables typically require burial in shallow water areas for protection from fishing activities or vessel anchoring. Drop cores combined with high-resolution geophysical survey data can accurately delineate areas where burial operations will encounter stiff resistance. C & C geoscientists have worldwide experience in interpreting such zones on the shelf and upper slope areas where problematic soil conditions may exist.

Boomer Seismic Surveys

These systems are typically operated from small boats and produce seismic images of the seabed to average depths of 40 to 60 meters below the seabed. C & C has conducted many surveys using boomer sources operating in the frequency band between 50 to 5,000 Hz. These data are recorded digitally and the interpretation is performed on seismic workstations.

Shallow Gas Surveys

High resolution seismic surveys centered about 100 Hz (single-channel or multi-channel) are needed to detect the presence of shallow gas within the top-hole section of the well. C & C owns and operates state-of-the-art recording systems, 6.25-meter group interval streamers (digital) and several air guns. C & C geophysicists can quickly interpret the seismic data on a number of available seismic workstations and identify those characteristic seismic signatures having a high probability of representing shallow gas accumulations.

Mud Flow Disturbance Surveys

The Mississippi River Delta is a depositional environment with some unusual and unique geohazards. Hurricanes and/or rapid deposition (floods) in the delta region can result in slope stability problems in the form of mud flows, collapse depressions, or retrogressive slides that can

Geophysical and Geosciences Services

cause pipeline damage. C & C can determine the extent of the sediment failures and any subsequent pipeline displacements.

Leg-Hole Inspection Surveys

Drilling engineers can be concerned with knowing the locations of prior placements of jack-up drilling rigs or lift boats around an existing platform or well template. To avoid depressions by subsequent drilling rig or lift boat operations, multibeam bathymetry and side scan sonar are two instruments that readily define and delineate leg hole locations.

Pre- and Post-Dredge Surveys

Dredging projects require very accurate sounding data of the project work area to calculate the volume of sediment to be removed. Pre-dredge surveys using multibeam systems provide assurance the volume of sediment within the dredging template will be accurately calculated. Post-dredge surveys with multibeam systems ensure the dredge template depth has been achieved and there are no high or missed spots that could potentially be a hazard to navigation.

3.5 kHz Subbottom Profilers

The 3.5 kHz frequency band is the standard for marine acquisition of high-frequency seismic data. C & C's vessels are equipped with heave-compensated, narrow-beam, hull-mounted transducers capable of clearly imaging the subbottom stratigraphy and structure. C & C's interpreters are experienced in using these data to make assessments on the nature of the subbottom soils. If required, they will identify and map any near-seafloor features such as faults or channels that could be a hazard or an engineering constraint for the project.

2-16 kHz “Chirped” Subbottom Profilers

This towed subbottom profiler has the ability to generate frequency modulated (chirped) seismic data between two and 16 kHz. The system is typically used for determining sand thickness or defining buried channel boundaries where sand may be located. The system can be operated on most vessels of opportunity.

“Chirped” Subbottom Profilers

This towed subbottom profiler has the ability to generate frequency modulated (chirped) seismic data between four and 24 kHz. This system is designed to operate on small vessels and is useful when imaging of near-seafloor sediments is critical to the project. This system is useful on engineering projects where tight vertical control is needed on near-surface, buried rock or hardpan.

Side Scan Sonar/Backscatter Mosaics

C & C data processors are experienced in the construction of seabed imagery maps (mosaics) from all of the company-owned sonar and multibeam suites. Programs running on high-end Unix and PC workstations allow fast processing and generation of georeferenced graphic images of the seabed.

Geophysical and Geosciences Services

XYZ Profiles for Span Analysis

Pipeline engineers concerned with bottom topography require detailed route profile data to determine pipeline spanning potential. C & C computer scientists developed specialized software that extracts water depth information at selected intervals along the proposed route and outputs the results in standard formats for importation into engineering programs.

Geotechnical division

C & C's geotechnical laboratory is staffed with personnel that have extensive experience in laboratory testing. The knowledge and experience of our staff allows them to provide innovative approaches to meet the geotechnical needs of our clients. Testing is performed using traditional equipment as well as custom-built testing equipment for model testing.

Range of services

Standard and advanced soil testing for offshore pipeline route studies

Standard and advanced soil testing for tension leg platform studies

Research studies on thermal conductivity and convection of soils surrounding buried deepwater flowlines

Dynamic soil testing for seismically active offshore sites

Model testing on suction anchors

Model testing to evaluate the effects of friction reduction coatings applied to mudmat skirts

Laboratory services

All standard index tests for soil classification

Organic content

Carbonate content

Permeability

Thermal conductivity

Miniature vane shear

Unconfined compression

UU triaxial

CU triaxial with pore pressure measurement

CD triaxial

Anisotropic consolidation, including K₀ consolidation

Direct shear

Direct simple shear

Incremental consolidation

Controlled rate of strain (CRS) consolidation

Resonant column

Cyclic direct simple shear

Cyclic triaxial

Land and Transition Zone Survey Division

The Land Survey Division has an experienced staff of professionals ready to provide survey and mapping services for onshore, inland and coastal water areas. Six licensed surveyors enhance the full time staff with registrations in Alabama, Arkansas, Florida, Mississippi, Louisiana and Texas. A.C.S.M. certified hydrographers and a civil engineer are also on staff. C & C's professional and technical staff specializes in performing cadastral, boundary, topographic, hydrographic, precise horizontal and vertical control, shallow water hazard surveys, proposed pipeline surveys, depth of cover/as-built pipeline surveys, construction stakeout of pipelines, and quantity/volume surveys. Additionally, C & C's professional and technical staff is experienced at working with title documents, government field notes and plats, topographic maps, aerial photographs and computation and compilation of field data. They are well versed in preparing alignment charts, plan and profile maps, right-of-way drawings, unitization drawings, aerial photo mapping, legal descriptions and preparing drawings for a variety of government agencies used for permitting.

Preliminary Planning Maps

Preliminary planning maps are project-specific maps using aerial photography background to aid in planning of major pipelines and infield infrastructure such as platforms, wells and flowlines. These maps aid in determining crossing positions of roads, rivers, bayous, streams and pipelines. Additional information depicted or inferred includes preliminary property ownership, terrain type and wetlands and access routes. These maps provide useful information for meetings with landowners and regulatory governmental agencies.

Right-of-Way Plats

Right-of-way plats are property-specific maps showing planned or existing routes of pipelines, roads, utilities or canals in relation to ownership lines used in acquiring right-of-ways.

Smart Pig Survey Layout

Smart pig survey layouts provide precise location of Above Ground Magnets used in determining the smart pig location and speed during pigging operations. By having high accuracy positioning on the Above Ground Magnets, isolation of problem pipeline sections are easily identified or located for investigation and/or replacement purposes.

DOTD River and Canal Crossing Surveys

River and canal crossing surveys are conducted to determine the bottom contour of the waterways being crossed to design proposed route crossings. These surveys can be used for the planning and/or monitoring of the waterway crossings and for determining the depth of cover above line(s) to identify potential problem areas of high or exposed pipe. C & C's field staff is trained and tested in DOTD Operator Qualification Requirements for survey personnel for both gas and liquids lines. C & C is currently registered with ISNNETWOLD and VERIFORCE for DOTD operator covered tasks.

Land and Transition Zone Survey

Shallow Water Hazard Surveys

Shallow water hazard surveys are detailed investigation surveys for pre-construction planning, pre/post abandonment projects, permitting of marine pipeline and flowline routes or platform and drill site placement. These surveys and reports comply with Minerals Management Service and U.S. Army Corps Of Engineers requirements and allow project managers and engineers to assess the feasibility of the site, along with the environmental and geological conditions for the project area.

Construction Layout Surveys

Construction layout surveys are conducted before or during construction. The purpose of the surveys is to control elevations, horizontal position, dimensions and configuration for the construction project.

As-Built/Depth of Cover Surveys

As-built surveys are conducted to determine and map the depth/elevation of the pipeline with respect to the natural ground. These surveys are required by DOTD and coastal uses permit compliance. C & C's field personnel are DOTD trained and registered to perform depth of cover surveys on both liquid and gas lines.

Staking of Proposed Locations

These surveys are conducted to collect data on the physical conditions of a drill site as well as physically marking proposed oil and gas well locations. C & C's survey teams work in conjunction with environmental specialists to collect required data for mapping, documentation and submission to state and federal agencies when requested. C & C routinely plots the client's job location with an aerial background from an in-house database to aid in identifying possible problem areas before going to the field.

Location of Plugged and Abandoned Wells

P & A well surveys are performed to locate abandoned well locations for re-entry or to accurately map the location as a geologically significant well from which geology and unitization may be based upon.

Pre- and Post-Dredging Surveys

Dredging projects require very accurate sounding data of the project work area to calculate the volume of sediment to be removed. Pre-dredge surveys using multibeam systems provide assurance that the volume of sediment within the dredging template will be accurately calculated. Post-dredge surveys with multibeam systems ensure the dredge template depth has been achieved and there are no high or missed spots representing a potential hazard to navigation.

Oil and Gas Well Drill Site Surveys

Well drill site surveys are performed to show proposed or as-built access routes and drill site configurations for the purpose of paying damages or negotiation of surface rights.

Land and Transition Zone Survey

Unit/Mineral Surveys

A unit or mineral survey is performed to generate a plan view plat depicting subsurface mineral boundaries prepared for the specific purpose of allocating mineral rights. C & C uses proprietary software customized to quickly and accurately draft unit plats.

Hydrographic Surveys

A hydrographic survey determines the depth of water, bottom topography, heights and times of tides and water stages, and the location of fixed objects for survey and navigation purposes. C & C's marine vessels are specifically designed and outfitted for hydrographic survey and mapping operations. C & C chooses to use state-of-the-art technology, such as C & C's C-Nav GNSS system, high precision single and multibeam echosounders, modern computing systems, and specialized navigation-hydrographic software to provide accurate and near real-time hydrographic surveys.

Topographic Surveys

Topographic surveys determine horizontal and/or vertical relations of selected natural and manmade features for a particular area. Project engineers use these surveys to aid in project layout and design use.

State Lease Tract Nominations

State lease tract nominations consist of plats and legal descriptions specifically prepared for submittal for state acreage nomination and/or to relinquish partial tracts or acreage.

Side Scan Sonar Surveys

Side scan sonar surveys are used for the detection, positioning and dimensioning of features found beneath the surface of the water, but above the natural bottom. Shallow water operations of these systems require special operational considerations.

Magnetometer Surveys

A cesium magnetometer is used for the detection of metallic or ferrous material such as well casings, pipelines, buried tanks, unexploded ordinance, or drums. C & C can provide these surveys onshore as well as inland and coastal waters.

Boundary Surveys

The primary purpose of a boundary survey is to determine the perimeter of a parcel or tract of land by establishing or re-establishing corners, monuments and boundary lines for the purpose of describing, locating of fixed improvements, or platting or dividing of a parcel.

Color Enhanced Lease Maps

Lease maps are prepared using color to better depict leaseholder information for specific projects. These maps aid lease brokers, landmen and operators to better manage their properties. Lease maps portray the progression of various leases for a given time span for particular properties. These mineral history maps aid in illustrating sometimes-complex lease and prescription issues used by title attorneys for abstracting leases.

Land and Transition Zone Survey

Aerial Photo Base Maps

Base maps are project specific maps depicting such items as section lines, well locations, pipelines, ownership, state lease outlines, conservation unit outlines and other requested pertinent information overlaid on aerial photography. These maps provide a general overview of the project area. They also aid in planning future infield infrastructure such as platforms, wells and flowlines. These maps provide a great source of information for meetings with landowners for surface and mineral negotiations or government agencies for regulatory requirements and restrictions.

GPS Static (Carrier Phase) Surveys

GPS static surveys are the most cost effective way of establishing highly accurate primary survey control in areas lacking such control. GPS carrier phase technology is used to establish survey control in remote areas or to increase density of control within an existing work area. The accuracy of this type of survey can far exceed that of conventional survey techniques.

GPS Real Time Kinematic Surveys

These types of surveys are the most cost effective way of collecting or establishing highly accurate survey positions. Accuracies of one-centimeter horizontal and two-centimeter vertical can be achieved within seconds. This positioning technique is in real time allowing for rapid, high accuracy data collection as well as stake out.

Marine Construction Survey Division

The Marine Construction Division consists of expert surveyors trained in offshore survey techniques with specialized equipment. These surveyors routinely position drilling rigs, pipeline lay barges and derrick barges, ultimately resulting in the drilling of the well, laying the pipe line and placement of the structure surface or subsurface. Deepwater surveyors use Surface Differential GPS coupled with acoustic navigation equipment such as USBL and LBL to accurately position and orient oil field equipment, such as pipeline landing end termination sleds, umbilical termination assemblies, seabed well templates, flowlines, pipelines or suction piles.

Dimensional Control Surveys

Before mobilization of an offshore surface or subsurface structure, a 3D tolerance analysis of the structure is performed in the fabrication yard or shipyard. The dimensional control analysis is performed to reveal and/or determine dimensional variation from the engineering specifications. Standard survey methods and tools are used to determine the measurements of the structures and a least squares method is used to determine the final results. Results are presented in a formal report, including measurements taken, calculated minus observed data, final conclusions and a graphic representation of the results.

Verification Check Survey of Vessel GPS

A verification check of a vessel's DGNSS system is performed via an error tolerance analysis method. Traditional survey methods or the use of GPS RTK are the two methods that can be used to perform GPS analysis. The traditional method uses government or C & C's established geodetic control points and a basic open-ended traverse to determine the geodetic position of the positioning antenna. The use of GPS RTK is the second method employed to determine the geodetic position of the vessel's positioning antenna. The results are presented in a formal report including measurements taken, calculated minus observed data, final conclusions and a graphic representation of the results.

Vessel Gyro Verification Check and Calibration

Before a survey, a gyro check can ensure the output is within the manufacturer's specification. C & C uses RTK GPS output from two antennas on the fore and aft of the vessel. Upon establishment of a baseline, readings from the vessel's north seeking gyro and attitude sensor are logged and collected. Upon completion, the vessel is positioned to the reciprocal heading and the above process is repeated. The final process is determining the north-seeking gyro offset. The results are presented in a formal report including measurements taken, calculated minus observed data, final conclusions and graphic representation of the results.

Differential GPS Integration into Dynamic Positioning Systems

C & C has performed the integration of NEMA standards or proprietary messages from surface or subsurface positioning sensors into dynamic positioning systems.

Marine Construction Survey

Dive Boat Positioning

The positioning support of four or five point diving operations begins with the generation of a base map containing foreign pipelines, valves, wells and any known obstructions. All information in support of the diving operations is logged with GPS and presented graphically on computer monitors.

Core Vessel Positioning

Positioning support of a four point anchor vessel involved with the retrieval of subsurface seafloor samples involves the generation of a base map depicting any foreign pipelines, valves, wells or seafloor obstructions. Services include support of the deployment and recovery of vessel anchors and final verification of the borehole location. The results are presented in a formal report including measurements taken, calculated minus observed data, final conclusions and graphic representation of the results.

Lift Boat Positioning

C & C offers positioning of self-elevating lift vessels for the installation support of pipelines, maintenance of existing structures, both surface and subsurface, and dive support operations. Services include positioning of the lift vessel in the required area of concern and verifying that the vessel is clear of existing pipelines, wells, jack-up can holes or other anomalies that might be present on the seafloor. The verification is performed using the MS 1000 Scanning Sonar.

Submersible Drilling Barge Positioning

C & C offers positioning support for submersible drilling barges involved with the drilling of a well. Services include positioning support for locating the barge to the proposed location and the final verification of the well location. The results are presented in a formal report including measurements taken, calculated minus observed data, final conclusions, graphic representation of the results and a final certified plat of the well location to be submitted to the Minerals Management Service.

Can Hole Location Investigation

C & C provides high resolution 360° scanning sonar capabilities. C & C uses state-of-the-art 360° scanning sonars operating at 675 kHz. The system has a maximum scan range of 300 feet and fulfills the requirements of pre-site investigation for vessels moving into areas around existing platforms. The system is also used to investigate, define and/or confirm existing can holes or hazards before the mobilization of a vessel onto the area of interest.

Jack-Up Rig Positioning

The positioning support of jack-up rigs involved with the drilling of wells includes horizontal control of the rig to the proposed location and the final verification of the well. The results are presented in a formal report including measurements taken, calculated minus observed data, final conclusions, a graphic representation of the results and a final certified plat of the well location for submission to the Minerals Management

Marine Construction Survey

Service.

360° Scanning Sonar Surveys

C & C uses state-of-the-art high-resolution 360° scanning sonars operating at 675 KHz. The system configuration fulfills the requirements of NTL (Notice to Lessees) No. 98-26/ Sections 30 CFR 250.913 (a), (b), (c) for exploratory or delineation wells drilled, platforms, single well caissons and well protectors. Pre- and post-well site clearance letters are produced to satisfy MMS requirements. The system can also be used to fulfill requirements by jack-up marine insurance carriers, locate debris or to track divers on the seafloor.

Semi-Submersible Anchor Drilling Rig Positioning

C & C employs its proprietary “All-in-View” system for positioning of semi-submersible drilling rigs and Anchor Handling Vessels. This proven system incorporates GPS (C-Nav and WAAS) and north-seeking gyrocompasses on all anchor-handling vessels in a clear and concise navigation graphics package. Each vessel’s navigation data is linked via radio telemetry, enabling each user to view the position of other users in real time in the graphic and analog displays. This feature allows users to view the overall progress of the project from the rig as well as the AHV. The system also offers the ability to transfer files over the radio telemetry link and makes an excellent aid to communication of status and changes during field operations. The services include positioning support for movement of the semi-submersible to the proposed location and the final verification of the well location. The results are presented in a formal report including measurements taken, calculated minus observed data, final conclusions, graphic representation of the results and final certified plat of the well location to be submitted to Minerals Management Service and a final anchor location layout plat.

Dynamic Positioning Rig Positioning

C & C offers positioning support of a DP Rig involved with the drilling of exploration or development wells. The service includes guidance of the DP Rig to the proposed location and the final verification of the well location. The results are presented in a formal report, including measurements taken, calculated minus observed data, final conclusions, graphic representation of the results and a final certified plat of the well location to be submitted to Minerals Management Service.

Shallow Water Derrick Anchor Barge Positioning

The positioning support of a shallow water derrick anchor barge involves the use of conventional GPS, gyrocompasses, navigation computers and specialized software. The derrick barge is anchored to the seafloor, requiring the anchor tugboat to be equipped with radio telemetry and blind tracking. This enables the barge to view the position of the tugboat in real time via the graphic and analog displays. The basic responsibility of survey personnel aboard the derrick barge is to assist the barge in deployment and recovery of the anchor spread, location of a new jacket location, making heavy lifts or the setting of piles.

Shallow Water Pipeline Anchor Barge Positioning

The positioning support of a shallow water pipeline anchor barge involves the interfacing of GPS and gyrocompasses to navigation computers and software. Anchor tugboats equipped with radio telemetry and blind tracking enable the barge to view the position of the tugboats in real time via the graphic and analog displays. The basic responsibility of survey personnel aboard the pipeline barge is to assist in deployment and recovery of the barge's anchor spread and to position the barge on the proposed pipeline route. As-laid information is logged and stored on the navigation computers. Upon completion of the field operations, as-laid charts are drawn and final reports are issued with pertinent information.

Shallow Water Jet Anchor Barge Positioning

The positioning support of a shallow water pipeline jet anchor barge involves the interfacing of GPS and gyrocompasses to navigation computers and software. Anchor tugboats equipped with radio telemetry and blind tracking enable the barge to view the position of the tugboats in real time via the graphic and analog displays. The basic responsibility of survey personnel aboard the pipeline barge is to assist in deployment and recovery of the barge's anchor spread and to position the barge on the proposed pipeline route. As-laid information is logged and stored on the navigation computers. Upon completion of the field operations, as-laid charts are drawn and final reports are issued with pertinent information.

Positioning for Dynamic Positioning Fabrication & Installation Construction Vessels

C & C supports the positioning requirements for swath and conventional vessels involved with on-site fabrication and installation processes. Examples include riser installation, spool piece installation and umbilical terminations. These campaigns are becoming more prevalent worldwide. C & C provides the entire package, from surface positioning and GPS integration of the dynamic positioning systems of the vessel to determining the required precise lengths of spool pieces determined by Extra High Frequency acoustic techniques.

Positioning for Dynamic Positioning S – Lay Pipeline Barges

Dynamically positioned barges can be equipped with surface GPS and subsurface dual acoustic positioning systems. Both positioning systems are interfaced to navigation software with all other support devices such as gyro, LBL or ROV sensors. These sensors can include Doppler Velocity Log, bathymetry or motion reference units. Data can be telemetried to other support vessels. Pipelay touchdown can be monitored both acoustically using the dual acoustic positioning system and visually by ROV. The results are presented in a formal report including measurements taken, calculated minus observed data, final conclusions, graphic representation of the results and a final certified plat of the well location for submittal to the Minerals Management Service.

Positioning for Dynamic Positioning J – Lay Pipeline Barges

Dynamically positioned barges can be equipped with surface GPS and subsurface dual acoustic positioning systems. Both positioning systems are interfaced to navigation software with all other support devices such as gyro, LBL or ROV sensors. These sensors can include Doppler Velocity Log, bathymetry or motion reference units. Data can be telemetried to other support vessels. Pipelay touchdown can be monitored both acoustically using the dual acoustic positioning system and visually by ROV. The results are presented in a formal report including measurements taken, calculated minus observed data, final conclusions, graphic representation of the results and a final certified plat of the well location for submittal to the Minerals Management Service.

Positioning for Dynamic Positioning Heavy Lift Derrick Barges

Moorings, suction piles, spar transport and jacket installations conducted from DP derrick barges are monitored and controlled using specialized navigation software. The DP derrick barge is controlled using tug management software to control the barge during lifting and installation operations. The helmsman of the anchor handling tugs and any other support vessels are equipped with real time display, showing all other vessels involved with the operation, along with relevant target positioning information to deploy anchors, suction piles or mooring legs.

Ultra Short Baseline and Long Baseline Acoustic Positioning

As drilling and construction activities migrate into deeper waters, accuracy becomes more critical in the developing oil fields throughout the world. To meet this challenge, C & C project management teams use proven acoustic methods and expertise to complete projects on schedule and within budget. ROV positioning and touchdown monitoring of pipelines and umbilicals are routine for C & C. Precise acoustic USBL methods are employed on construction projects, as are precise LBL Medium Frequency Wide Band positioning. Spool-piece/jumper metrology (LBL MD WIDE BAND), pipeline as-built and inspection (USBL/LBL) and subsea structure orientation (LBL and external sensors) are other acoustic positioning services offered. C & C is the industry leader in planning and providing viable acoustic solutions to meet the needs of any client's subsea projects.

Hydroacoustic Aided Inertial Navigation Positioning

C & C uses HAIN positioning technology as an accurate and reliable alternative to traditional acoustic positioning methods. Accuracies of the HAIN system are similar to LBL techniques, while costs are lowered by eliminating the use of large seabed arrays and reducing calibration time required.

Unmanned Systems Division

The Unmanned Systems Division has recently co-developed its new Unmanned Semi Submersible, which provides an extended survey presence over areas not suited to a manned launch.

Unmanned Semi Submersible Survey Services

C & C's USS is designed to provide an extended survey presence over areas not suited to a manned survey launch. Its design provides both a wider operational weather window and a longer continuous operations time frame for more efficient and safer surveys.

When weather is poor, launches are not deployed. C & C's USS is less weather dependent than other vessels and minimizes the need for personnel to leave the mother ship.

C & C's USS can perform NOAA hydrographic surveys with a fleet of unmanned semi submersible vehicles operating simultaneously from one mother ship resulting in increased production and better data quality than alternative means.

C & C is currently the only company capable of providing hydrographic surveys via this advanced technology.

The USS is built of marine grade aluminum drawing on C&C's experience of sensor integration and operation along with Autonomous Surface Vehicles, Ltd. design and construction expertise. The USS is designed to be both rugged in design and use COTS parts for cost effective operations and repairs.

West Coast Division

The West Coast Division is staffed with eight experienced staff members based near Seattle, Washington. The office will provide geoscience services and special projects along the west coast of North America, in Alaska, and worldwide. Services include hydrographic services, geophysical services, soils engineering services, physical oceanographic projects, marine construction support, underwater positioning, geospatial services and route surveys.

Alliance partners

C & C has developed alliances with established international organizations to capitalize on synergies and promote a diversified line of services. Alliance companies are carefully chosen based on services provided, expertise, financial strength and available locations throughout the world. The companies detailed below have demonstrated the ability to serve clients with the same superior performance that C & C prides itself in providing.

Autonomous Surface Vehicles, Ltd.

ASV joins C & C as a part of Global Fusion's Unmanned Systems Group. Global Fusion is a privately owned international marine services group based in Lafayette, Louisiana, USA. The Global Fusion family of companies provide a range of marine services including offshore positioning, survey, geoscience, and autonomous marine vehicle services worldwide. ASV is based in the United Kingdom. The company provides unmanned marine vehicle services and products worldwide with commercial, military, and academic applications. Services and products include the following:

- Conversion of conventional craft to unmanned craft
- Concept design, testing, prototype construction and sea trials
- Detailed design and engineering services for specific projects
- Fast marine target drones
- Unmanned survey and surveillance vehicles
- Mobile buoy networks for positioning of underwater vehicles
- Minehunting platforms for naval mine warfare applications
- Fast towed-body vehicles

Saipem (ROV Support)

Saipem is a leading ROV contractor to the offshore oil and gas industry, providing quality cost-effective solutions for subsea environments for over 20 years. Through a network of worldwide facilities, Saipem supplies a wide range of services to its international clients throughout the world. In 2001, Saipem and C & C Technologies began an alliance, which resulted in C & C garnering a permanent survey support presence on the construction support vessel the HOS Innovator. In 2004, the alliance remains strong with C & C capturing a second contract to provide survey assistance onboard the HOS Dominator. Saipem, a part of Eni, is one of the largest integrated energy groups in the world with an annual turnover in excess of \$64 billion dollars. Through the provision of a unique combination of innovative engineering, design and extensive equipment, Saipem can supply deepwater solutions in the areas of: Flowline installation and burial Umbilical installation and burial Subsea construction Rigid pipeline tie-ins Flexible pipeline tie-ins Diverless pipeline repair systems Inspection and maintenance The extensive capabilities within the Saipem Groups are complemented by strategic alliances with leading contractors and manufacturers, and the commitment to the highest possible standards in quality, health, safety and the environment.

W.L. Gore & Associates, Inc. (Geochemical Surveys)

The Survey Products Group at W. L. Gore & Associates, Inc. provides advanced surface geochemical technology using their GORETM Surveys for Offshore Exploration product.

Alliance Partners

This service provides offshore operators with what is already a proven and widely accepted onshore capability for the detection, differentiation and delineation of hydrocarbon microseepage across a broad spectrum of compounds. C & C and GORE have worked collectively on several successful offshore geochemical projects over the last two years. The GORE™ Survey delivers direct hydrocarbon indication of a prospect's charge, giving organizations the information they need to focus exploration efforts, thereby reducing costs, reducing risks and increasing success. The alliance between C & C and GORE enables both turnkey and "piggyback" programs for affordable data acquisition. Clients can take advantage of C & C's worldwide fleet deployment, which makes sample collection easy, efficient and economical. C & C will orchestrate the sample collection process wherever their vessels are located. Gore will then analyze the samples and generate maps showing the results of the survey.

Woods Hole Group (Current Studies)

Woods Hole Group is a leader in coastal and oceanographic sciences and engineering, including oceanography & measurement systems, coastal sciences engineering & planning, analytical chemistry, and environmental impact assessment. Woods Hole Group also provides real-time monitoring systems that collect, analyze and report data required to meet the challenges of worldwide environmental problems. Its staff includes dedicated and highly qualified scientists and engineers experienced in solving environmental problems. The total staff is approximately 80 dedicated persons and provides the following services: Oceanography and Measurement Systems Coastal Sciences, Engineering & Planning Aquatic Environmental Assessment Environmental Laboratories C & C Technologies can provide field support including current sensor deployment and retrieval, and other field data acquisition