



THE INGENEER

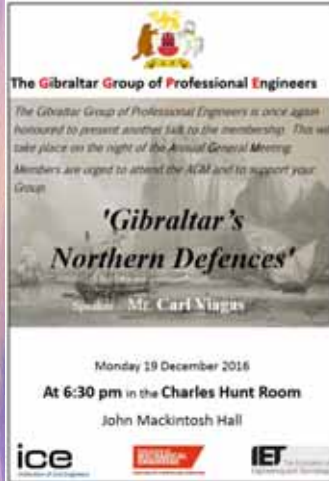
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Best Wishes For 2017

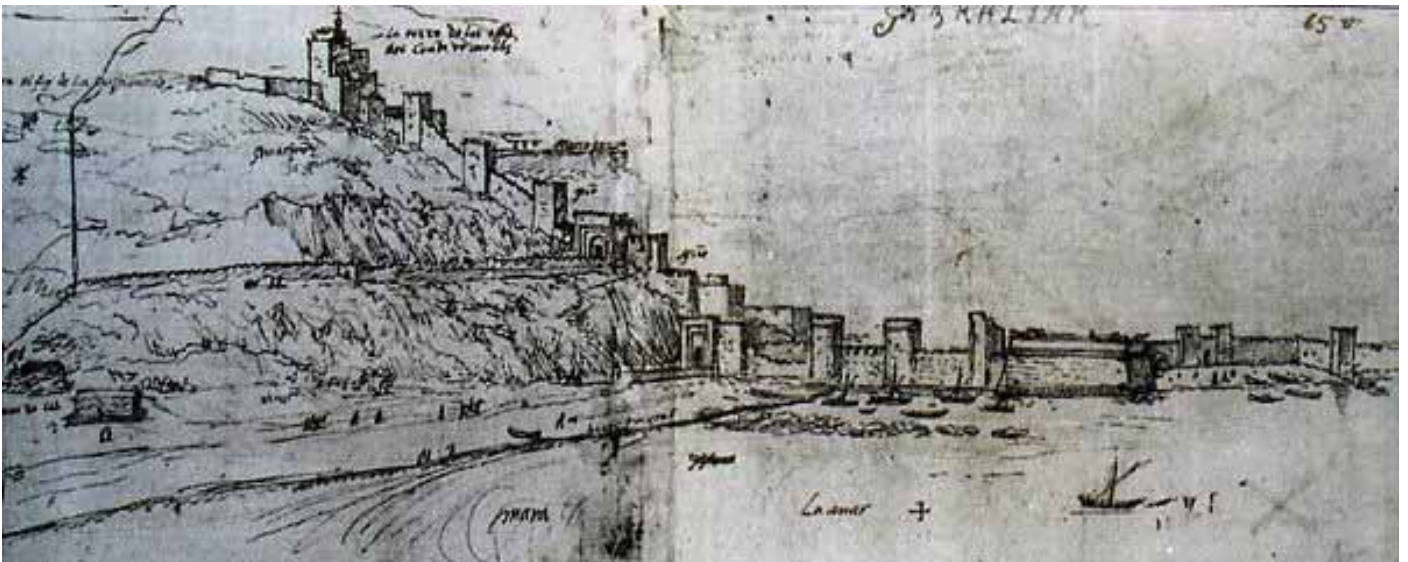
SEASONS'S GREETINGS



The Group's annual General meeting took place at the Charles Hunt Room of the John Mackintosh Hall at 06:30pm on Monday 19th December 2016. The AGM was preceded by a talk by Architect and Urban Renewal local expert Mr Carl Viagas. As the Government's Heritage Conservation Officer Carl has project managed the clearing up and refurbishment of the area known as The Northern Defences. Carl was introduced by the Deputy Chief Minister, Dr Joseph Garcia, who championed the project.



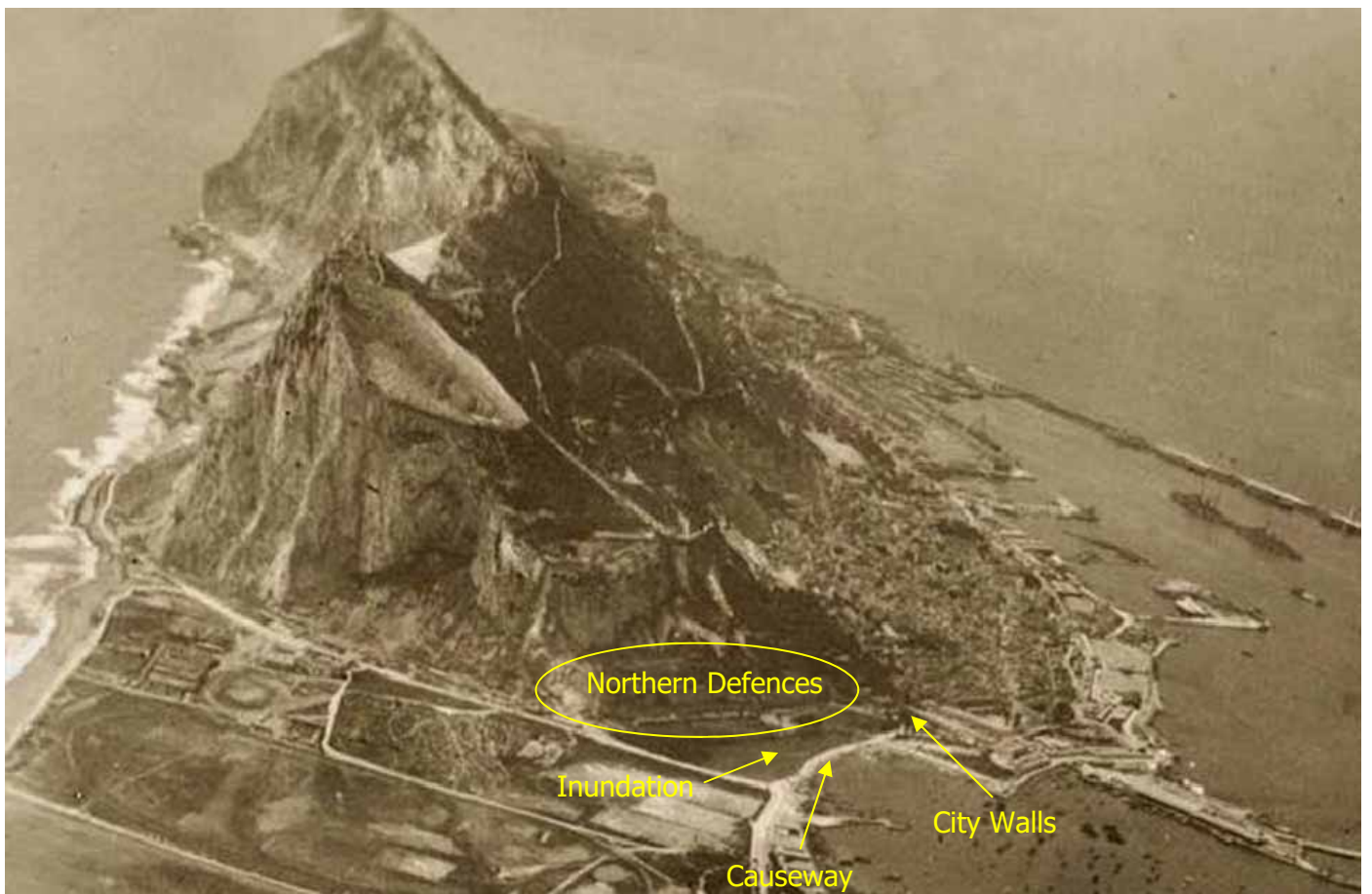
The Group's Chairman, David Orfila, introducing the Deputy Chief Minister, Dr Joseph Garcia, and Mr Carl Viagas, Government's Heritage Conservation Officer, to the Members.

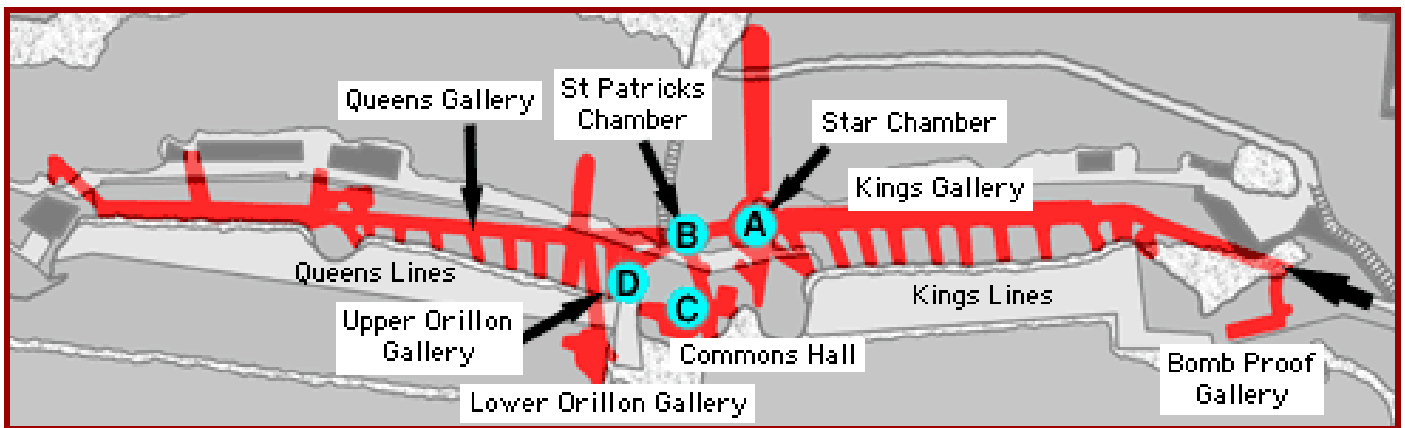


Dr Garcia said he had thought it should be the duty of the Government to clear up and expose the interesting network of historic military tunnels and Fortifications that make up the Northern Defences and which cover some 1000 years of military history in just one area of Gibraltar.

Carl Viagas then gave a presentation on the Northern Defences, which included a short history of the area. He said that the Northern Defences was an area covering the whole of the North Front from where Gibraltar could be defended from land inva-

sion. There is a sketch of around 1567 showing the main access route to Gibraltar and via Landport and its defences. This sketch already shows the transition from defences against arrows and catapults to that of defending against Gunpowder with archery towers scheduled to be pulled down to give way to Bastions from where guns could be deployed. . British defences commenced around 1756 Gibraltar's importance grew as a result of the loss of Menorca. The idea of the defences is to force the enemy into a bottleneck where they can be easily killed especially using enfilading fire.





Carl explained that the area had been neglected for a very long time earning the nickname of The Jungle. It's been used as a rubbish dump for a considerable amount of time with fridges, mattresses, rubble and even motorcycles thrown over the wall which have since accumulated there. The main purpose of the project was to clear up the area in order to recover this unique historical site, and prepare the area safely in order to be able to make it available to the general public in the future.

Its awkward location, its difficult access and the amount of rubbish, with 500 tons removed so far, has been a logistical nightmare for the contractors involved. The three main points of access to the site are through a tunnel on Moorish Castle Estate, the road to lines which has been blocked up and finally Grand Battery where vehicle access has meant that a base camp was established there. This enabled a chute to be placed at the top of the northern defences down to Grand Battery to assist the disposal of the waste. As part of the disposal, a number of cannonballs, mortars and shells have been found which have their own heritage value and could be displayed on the site when it is ready. This exercise has exposed a series of mortar positions and loop holes which range from the 18th century to the WWII. This has assisted in highlighting the importance that the Northern Defences has had in defending Gibraltar.

The Royal Engineers have been involved in the project especially in a link from the northern defences to the Upper Galleries and then to the Upper Rock. On completion it will be possible to walk from the Upper Rock all the way down to Casemates. The assistance provided by the Royal Engineers greatly appreciated, but having the descendants of the Royal Artificer Corps involved, who were the architects of such defences, adds value to the whole project.

At present, one is able to register an interest in visiting the sites at the Gibraltar Heritage Trust premises at John Mackintosh Square, to then be able to

join a guided tour which is given at regular intervals.



At the end of the talk, after a questions and answer session, the Chairman thanked Mr Carl Viagas and presented him with a memento of the occasion.

A.G.M.



The Chairman then declared the annual general meeting open. The Minutes of last year's AGM were approved following which the Chairman presented his report, followed by the Secretary's report and the Treasurer's report. The audited accounts for the year were presented and approved by the meeting. Elections of officers then took place with the following being approved unanimously:



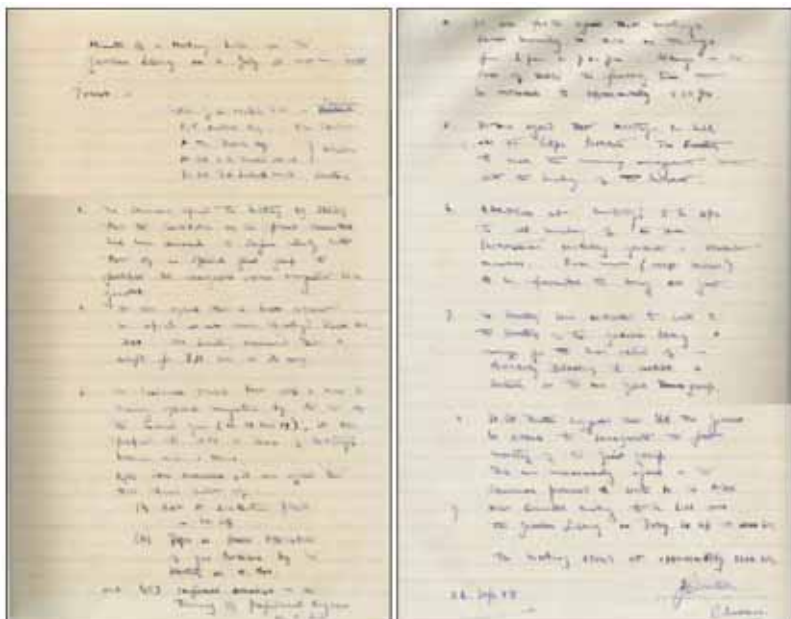
Chairman – Mr. Emil Hermida
 Vice-chairman – Mr Manolo Perez
 Treasurer – Mr. Xavier Pons
 Secretary – Mr. Ashley Harrison

Bart Van Thienen and John Baldachino have resigned from the committee. Louis Parody and Richard Labrador

were elected committee members. The committee is encouraging young engineers to join the committee, to ensure the future of the group and its activities. At the meeting four young Engineers were unanimously elected to join the committee; they are:

Mr Daren Cruz (Other), Mr Chris J Gomez (IMechE), Mr Stephen Cooper (ICE)., Mr John Joe De La Paz (ICE).

Below is the scanned copy of the minutes of the constituting meeting of the Group dated 11 July 1958



During proceedings, the committee announced plans to celebrate their 60th anniversary celebration, when they will be expecting to host the Presidents of their three sponsoring Institutions, Institution of Civil Engineers, the Institution of Mechanical Engineers, and The Institute of Engineering and Technology. Amongst other events being planned, students from the local schools will be encouraged to participate, as well as hosting a Gala Dinner at the top of the rock. The membership will be kept informed as planning develops over the next eighteen months.

The subcommittee formed to organize events for the 60th anniversary is lead by Xavier Pons and is composed of Emil Hermida, David Orfila, Louis Parody, Richard Labrador and Manolo Perez.

VISIT TO RFA MOUNTS BAY



Lieutenant General Ed Davis. Mounts Bay had docked at Gibraltar for a month of repairs.

The Bay-class ships have a full load displacement of 16,160 tonnes (15,900 long tons). Each is 176.6m long, with a beam of 26.4m, and a draught of 5.8m.

Propulsion power is provided by two Wärtsilä 8L26



On Wednesday 21 September 2016 a contingent from the Gibraltar Group of Professional Engineers visited the RFA Mounts Bay. On arrival they were met by Marine Engineering Officer Ian (Graham) Bell. He passed the Group on to Chief Officer Deck Alister Clack who showed the Group the bridge and associated activities. Graham then took the visitors for the rest of the tour, including most engineering aspects.

Mounts Bay and sister ship Cardigan Bay were ordered from BAE on 19 November 2001. Mounts Bay was laid down at BAE's shipyard at Govan, Scotland on 25 August 2002. She was launched on 9 April 2004. Mounts Bay was dedicated on 13 July 2006, the first Bay-class ship to enter service with the RFA. In January 2016, she set sail for the Mediterranean, carrying the new Governor of Gibraltar,



generators, providing 6,000 4.5MW and two Wärtsilä 12V26 generators, providing 6.7MW. These are used to drive two steerable propulsion pods, and bow thrusters. Maximum speed is 18 knots, a range of 8,000 nautical miles at 15 knots. Mounts Bay can receive two 30mm DS30B cannons, two Mk.44 miniguns, six 7.62mm L7GPMGs, and a Phalanx



CIWS. The standard ship's company consists of 60 officer and sailors .

As a sea lift-ship, Mounts Bay is capable of carrying up to 24 Challenger 2 tanks or 150 light trucks. The cargo capacity is equivalent of 200 tons of ammunition, or 24 Twenty-foot equivalent unit con-



tainers. During normal conditions, a Bay-class ship can carry 356 soldiers, but this can be almost doubled to 700 in overload conditions. No helicopters



are carried on board, but the flight-deck is capable of handling helicopters up to the size of Chinooks, as well as Merlin helicopters and Osprey tilt-rotor aircraft. The well dock can carry one LCU Mark 10 or two LCVPs, and two Mexeflotes can be suspended from the ship's flanks. Two 30-ton cranes are fitted between the superstructure and the flight deck.

On May19,2016, she was deployed to assist in the search for the missing Egypt Air flight MS804 in the Mediterranean between Crete and Egypt. As of 29 June 2016, she has been deployed with the European Union's Operation Sophia to target Daesh gun and people traffickers.

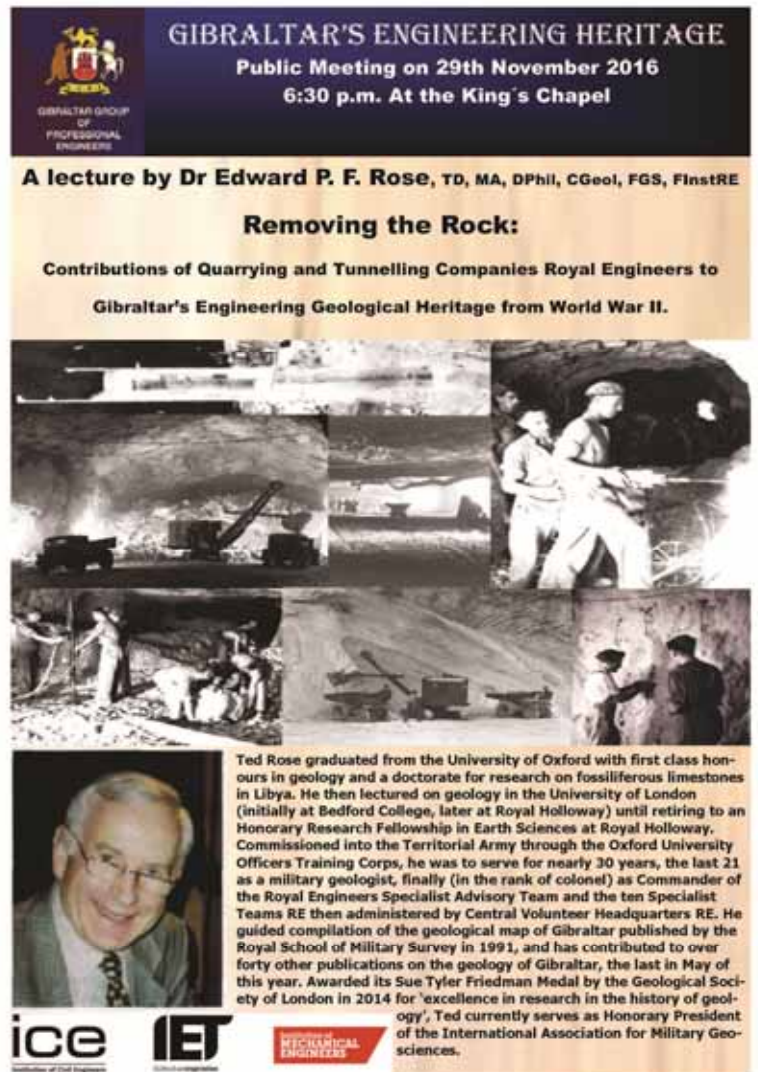


It was a most interesting visit taking 2 1/2 hours. Officer Cadet Richard Bodnar-Smith accompanied the Group throughout. The Group ended up in the conference room for a cup of tea and question and answer session lead by Marine Engineering Officer Ian (Graham) Bell. At the end the Past Chairman Richard Labrador thanked Graham in the usual manner.

ENGINEERING HERITAGE LECTURE

This years Engineering Heritage Lecture was delivered by Dr. Edward P F Rose, , TD, MA, DPhil, CGeol, FGS, FInstRE.

Ted Rose graduated from the University of Oxford with first class honours in geology and a doctorate for research on fossiliferous limestones in Libya. He then lectured on geology in the University of London (initially at Bedford College, later at Royal Holloway) until retiring to an Honorary Research Fellowship in Earth Sciences at Royal Holloway. Commissioned into the Territorial Army through the Oxford University Officers Training Corps, he was to serve for nearly 30 years, the last 21 as a military geologist, finally (in the rank of colonel) as Commander of the Royal Engineers Specialist Advisory Team and the ten Specialist Teams RE then administered by Central Volunteer Headquarters RE. He guided compilation of the geological map of Gibraltar published by the Royal School of Military Survey in 1991, and has contributed to over forty other publications on the geology of Gibraltar, the last in May of this year. Awarded its Sue Tyler Friedman Medal by the Geological Society of London in 2014 for 'excellence in research in the history of geology', Ted currently serves as Honorary President of the International Association for Military Geosciences.



GIBRALTAR'S ENGINEERING HERITAGE
Public Meeting on 29th November 2016
6:30 p.m. At the King's Chapel

A lecture by Dr Edward P. F. Rose, TD, MA, DPhil, CGeol, FGS, FInstRE

Removing the Rock:
Contributions of Quarrying and Tunnelling Companies Royal Engineers to Gibraltar's Engineering Geological Heritage from World War II.

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ice **IEI** **MECHANICAL ENGINEERS**

The lecture was entitled Removing the Rock: Contributions of Quarrying and Tunnelling Companies Royal Engineers to Gibraltar's Engineering and Geological Heritage from World War II . It took place at the King's Chapel . The event drew a large audience and it is interesting that despite competing events such as the Chris Wroe from Trinity House talk to the Gibraltar Heritage Trust and the AGM of the Gibraltar Social Democrats, we managed to overflow the seating capacity at the Kings Chapel (See below a Photograph of the Chapel filling up).





Ted was introduced by The Hon Dr John Cortes MBE MP JP CBiol CEnv, Minister for Education, Heritage, Environment, Energy and Climate Change., who thanked him for the work he had done over the years on the geology of Gibraltar.

Short mineral ... description *Trans Roy Soc Edin* 1793

- **James Smith of Jordanhill** (1782-1867)
ex-Renfrewshire Militia – Gibraltar 1842-1844
Geology of Gibraltar *Quart JI Geol Soc London* 1845

- **Charles Warren** (1840-1927)
Royal Engineers – Gibraltar 1859-1866 Topographical *map of Gibraltar 1:2,500* 1864 base for geological map: AC Ramsay & J Geikie 1876

He then commented on Ramsay & Geikie ´s geological map.



Ted introduced his lecture by commenting on the British pioneers of Gibraltar ´s geology:

- **Thomas James** (ca 1720-1782)
Royal Artillery – Gibraltar 1749-1755
History of the Herculean Straits 1771
- **Ninian Imrie of Denmuir** (ca 1752-1820)
The Royal Scots – Gibraltar ca 1784-1793

Ramsay & Geikie's 1876 geological map



- Jurassic limestone **overlain** by single 'shale' unit to west
- **Normal fault** downthrows limestone at the North Face of the Rock
- **NW-SE Great Main Fault** separates westward-dipping Main Ridge from eastward-dipping Southern Plateaux limestone
- Superficial deposits of sands and 'breccias' flank the bedrock

He went on to discuss the construction of

the airfield at Gibraltar in the context of World War II airfield construction requirements in the UK. Airfield construction in the UK had accelerated in World War II, reaching a peak of 856. Construction of new fields for the RAF or USAAF was largely by units of the Royal Air Force, or Road Construction Companies RE plus other RE units. All (apart from harbours for sea planes) were constructed entirely on land – with no need for reclamation from the sea.

The Gibraltar airfield's primary wartime purposes were:

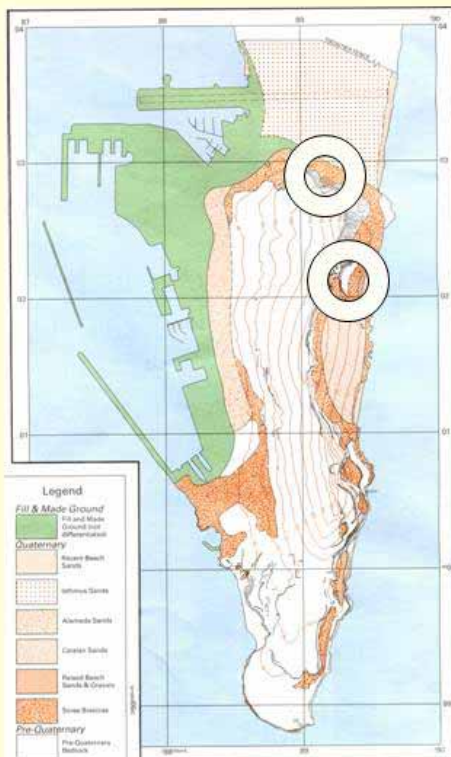
- 1 A staging post for aircraft in transit between the UK, Malta and Middle East Command in Egypt
- 2 An assembly point for aircraft supporting the Allied invasion of North Africa in November 1942: Operation Torch
- 3 An assembly point for aircraft supporting the Allied invasion of southern France in August 1944: Operation Dragoon

In Gibraltar the construction of the runway involved reclamation from the sea as in 27 October 1941 the Air Ministry ordered the extension of the emergency strip on isthmus west into the Bay to a total length of 1,550 yards at a width of 100 yards. This was completed by November 1942. It was later decided to increase the length to 1800 yards and this was completed by JULY 1943. These extensions required considerable quantities of rock fill certainly far more than could be provided by tunnel spoil.

In the past some fill for reclamation of land from the sea had been quarried from the slopes of the Rock as fortification developed. Considerably more had been quarried at the end of the 19th century to facilitate extension of the dockyard. Therefore these sources were also used to provide fill for the airfield extension.

The Excavator Company Royal Engineers Disembarked at Gibraltar from the UK on 4 February 1942. An almost unique unit – there had been no provision before 1939 for the use of mechanical excavators in the British Army - only 135 Excavator

Primary source of fill: Quaternary scree breccias



Extract from Rosenbaum & Rose's 1991 *Geological Map of Gibraltar*, Royal School of Military Survey misc map 25

The Jurassic bedrock that forms Gibraltar's Main Ridge and Southern Plateaux is flanked by scree breccias and windblown sands that formed periodically during the Quaternary - essentially the last 2.5 million years: a time of fluctuating changes in climate and relative sea level as Gibraltar was progressively raised from the sea by northward movement of the African tectonic plate

February 1942: work on the airfield already in progress by 703 General Construction Company RE

Breccias were quarried:

- (1) in Catalan Bay
- (2) at the North Face of the Rock

Company RE, formed in September 1939 and sent in October to support the British Expeditionary Force in France, by trench excavation, had borne the name; 135 disbanded following evacuation from Dunkirk, losing all its equipment

The Excavator Company on Gibraltar, commanded by Major H Wilkinson MM RE, comprised a headquarters, two mechanical equipment sections, and a quarrying section

It was assembled from 5 components:

- three officers plus 69 other ranks (and eight more sent as an advance party);

- one officer plus 53 other ranks specifically as drivers;

- 52 pioneers, to provide relatively unskilled labour;
- one officer and 47 other ranks from 855 Quarrying Company RE; and

- one officer plus 47 other ranks from the Royal Canadian Engineers (to form a Diamond Drill Section)

Total strength: 6 officers and 274 other ranks

Differed from 135 excavator company in containing quarrying & drilling sections .

By quarrying from the sites mentioned the fill produced by the Excavator Company RE in 6 Months amounted to some 0.5 Million Cubic Yards. Compared to this the Tunnelling Companies excavated a total of 1 Million Cubic yards from 1940 to 1945.

Scree breccias quarried adjacent to the airfield



Imperial War Museum photo: a Hudson generating dust in August 1942

Quarrying by drilling/blasting, from mid-March in two shifts 07.00-13.30, 13.30-20.00 From April, at Canadian suggestion, by means of water-jet from modified flame-thrower Output for the Excavator Company overall averaged 2000-4000 cubic yards per day

Ted then described the various roles undertaken by The Royal Engineers Quarrying Companies at various locations during the war and for various pur-

poses thus bringing the work done in Gibraltar into the larger context of the second world war. In the same context he explained the foundation and roles of the Royal Engineers Tunnelling Companies.

Principal current tunnels and chambers



see Rosenbaum & Rose (1992) *The Tunnels of Gibraltar*. Gibraltar Museum

178 Tunnelling Company RE began by work in the north
180 Tunnelling Company RE began by work in the south-east

Tunnelling in Gibraltar had not only been carried out by the REs. The City Council had also carried out tunnelling mainly for the Water Supply system.

Tunnel length pre-war & wartime (end Sep 1943) - in feet

Client	Pre-war	Wartime to Sep 43	Total
The Navy	12,600	1,510	14,100
The Army	7,470	36,000	43,470
City Council	6,030	4,070	10,100
TOTAL	26,100	41,580	67,680

Total completed to end September 1943 was 67,680 feet = 20,629 m
172 Tunnelling Coy then scheduled to complete 6,520 feet = 1,987 m
TOTAL = 22,616 m

Data from The National Archives: official War Diary of the Chief Engineer, Gibraltar

Methods of excavation

(see Wilson 1946; Haycraft 1946; Cotton 1948, 1963; Ramsey 1978)



Source: Imperial War Museum



Excavation in 1941; and REME chambers (workshops) 1943-1945 with span 16 m, height to crown of arch 10 m, and length 120 m the largest of the military chambers

Gibraltar's geological heritage from quarrying



'Shales' exposed in bedrock beneath the breccia at the North Face quarry

The quarrying and excavating activities exposed areas of the Rock yielding interesting data on which to update geological knowledge. Sapper AL Greig, a graduate of the Royal School of Mines serving on Gibraltar as a driver, was tasked by Lt-Col A R O Williams and the Director of the Geological Survey of Great Britain, (Sir) E B Bailey, with compiling a new geological map and report to update the 1876

Gibraltar's geological heritage from quarrying



'Shales' exposed in bedrock beneath the breccia at Catalan Bay quarry

map of Ramsay & Geikie. He inferred that 'shale' lay under the limestone. Greig discovered fossil ammonites in 'shales' in the Catalan Bay and North Face quarries, identified at the Natural History Museum in London as:

Rhacophyllites stella

Rhacophyllites sp.

Lytoceras aff. *audax*

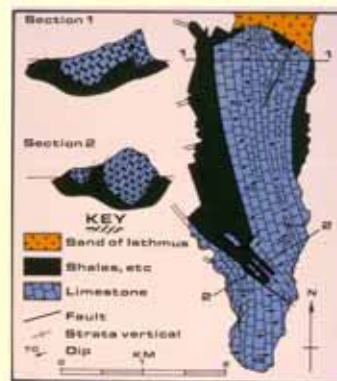
Harpoceras sp.#

Phylloceras aff. *calais* #

Lytoceras sp.#

By comparison with better preserved specimens from other countries in the Mediterranean region, they indicated a Mid Liassic age for part of the 'shales', i.e. younger than the Early Liassic Gibraltar limestone above. His work permitted a geological re-interpretation. Greig's map, diagrams report and fossil ammonites, supplemented postwar by data from Capt G B Alexander, formed the basis of Bailey's re-interpretation of Gibraltar's geology published in 1953.

(Sir) Edward Bailey's 1952 geological 'map': see *Quart Jour Geol Soc London* 1953



- Based on 1943 work of Sapper A L Greig
- 'Shales' both west and east of the main ridge
- Single shale unit - which underlies the limestone
- Transcurrent rather than normal fault at the North Face
- The Rock is an inverted 'klippe' - thrust into place during the Betic orogeny

but see Rose (2014) in *Earth Sciences History* vol 33

After the end of the war, 172 Tunnelling Company was reduced in size to a troop, and became part of a re-constituted 1st Fortress Squadron RE on Gibraltar - successor to the Company of Soldier Artificers founded within the fortress of Gibraltar in 1772 that became the first rank-and-file unit of the Royal Engineers. That troop was disbanded on completion of its final tunnel in 1967, and the remaining tunnellers were posted to other units.



The lecture delivered by Ted Rose provided a far wealthier amount of information than has been summarised here. He concluded by saying that the 1943 geological map and account by Sapper Greig and the 1953 article derived from them by E B Bailey have now been superseded by a 1991 geological map published by the (Royal) School of Military Survey – and by a wealth of academic geological publications – but the quarries and tunnels formed by partly removing the Rock provide a geological legacy of enduring significance.

When considering this year's Engineering Heritage Lecture the GGPE was mindful that it was an anniversary year. It marked the Tercentenary of the Establishment of the Corps of Engineers. In 1714 the organisation of the Board of Ordnance was reassessed and the then Chief Engineer, the Right Honourable Brigadier Michael Richards, proposed that artillery and engineers should be placed on separate establishments. This was subsequently enacted by Royal Warrant on 26th May 1716 and it is from this point that the Royal Artillery and the then Corps of Engineers pursued their separate paths, the latter consisting solely of officers. Ted aptly concluded his lecture by quoting from a 1855 definition by Capt T W J Connolly *History of the Royal Sappers and Miners* :

'What is a Sapper? This versatile genius... condensing the whole system of military en-

gineering and all that is useful and practical under one red jacket. He is a man of all work of the Army and the public - astronomer, geologist, surveyor, draughtsman, artist, architect, traveller, explorer, antiquary, mechanic, diver, soldier and sailor; ready to do anything or go anywhere'

The Chairman, David Orfila, thanked Ted for his informative and interesting lecture and presented him with a memento of the occasion. There followed a reception in the music room behind the Kings Chapel.

The following day Ted was joined by Manolo Perez



Ted Rose and Manolo Perez at the University of Gibraltar



and Richard Labrador on a tour of the University of Gibraltar. There they were shown round by Paul Bowling the Chief Financial and Operations Officer and briefly met with Prof Daniella Tilbury inaugural Vice-Chancellor and CEO of the University of Gibraltar.