

U.S. Department
of Transportation

United States
Coast Guard



Commandant
U.S. Coast Guard

21 Second Street S.W.
Washington, DC 20593-0001
Staff Symbol: G-NRN-1
Phone: (202) 267-0990

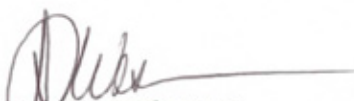
16562
Ser: 94/10091
MAY 17 1994

From: Commandant
To: Commander, Coast Guard Activities Europe

Subj: RELEASE OF TOWER INVESTIGATION

Ref: (a) Your ltr 16562 of 11 Apr 94
(b) Phoncon Cdr Taggart/LCDR Loesch of 18 Apr 94

1. The LORSTA Kargaburun Tower Report is being reviewed. The Loran-C transfer/negotiation team will provide the information to RADM Fronzuto at an appropriate time in the future.
2. Upon receipt of Italian request as per ref phoncon, the negotiation team will contact RADM Fronzuto for further action.
3. Thank you for forwarding this information request by RADM Fronzuto. My POC on this matter is CDR D. Taggart at (202) 267-0990.


J. F. WESEMAN
By direction



11000
26 May 1994

From: Commander, Coast Guard Activities, Europe
To: Commandant (G-NRN)

Subj: PROFESSIONAL SOCIETY PRESENTATION ON LORSTA
KARGABURUN TOWER COLLAPSE ANALYSIS

1. I request permission to permit a professional society presentation on the Loran Station Kargaburun tower collapse by the structural engineer (Mr. Mark Fantozzi) and tower engineer (Mr. Heath Hollingsworth) who conducted the independent Architect/Engineer analysis of the collapse. Their enclosed abstract is due for submission by 15 June 1994 in order for the presentation to be made during the 1995 International Association for Shell and Spatial Structures (IASS) Symposium.

2. The permission will be granted under FAR clause 52.227-17, Right's in Data-Special Works, in Contract No. DTCG43-93-C-H9ZE43 by the Contracting Officer. If there are any questions, please contact me.

A handwritten signature in dark ink, appearing to read "R. M. Loesch".

R. M. LOESCH
By direction

Encl: (1) The Fantozzi Company letter and abstract of 26 May 94

the
FANTOZZI

company, Inc.

Engineers/Designers

93 Devine Street San Jose, CA 95110 (408) 297-2700 FAX (408) 297-2766 TLX 4997037

May 26, 1994

SENT VIA FAX: 44-71-872-0939

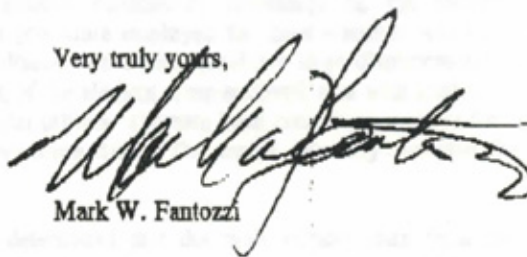
LCDR Robert M. Loesch
United States Coast Guard
Coast Guard Activities Europe
5 Hanover Square London, W1R 9HE

Re: Abstract "Collapse Analysis of a 190 M Guyed Mast"

Dear Lieutenant Commander Loesch:

Following is the abstract I prepared relating to the analysis of the Loran C mast in Turkey. The paper will present the findings of our analysis in much the same context as our report. If you have any questions, please contact me at your convenience. Abstracts for the 1995 IASS Symposium are due June 15, 1994.

Very truly yours,



Mark W. Fantozzi

ENCLOSURE (1-)

ABSTRACT
COLLAPSE ANALYSIS OF A 190 M GUYED MAST

This paper presents the findings of a site investigation and failure analysis of the collapse of a 190 meter (625 ft) top-loaded guyed mast. The mast was located in Turkey and collapsed during a unusual snow storm under relatively calm wind conditions. Observers at the site reported snow build-up on the stays up to 1 1/2 inches in effective radial thickness prior to the collapse of the mast.

The site is located near the coast with a 3 % slope. The original drawings showed the installation of the mast on a level site. The installation specifications provided a table for adjusting the anchor locations to account for variation in grade. The site investigation revealed that no adjustment was made in the anchor locations to account for the grade variation.

In general, a 3 % slope would not significantly affect the performance of short masts with a standard stay arrangement. However, the anchors for the top load radials were located at a radius of 260 meters from the base of the mast. For this distance, the difference in elevation from the uphill anchor to the downhill anchor was nearly 15 meters. This gradient was found to have a significant effect on the buckling load of the mast due to the change in the stiffness of stays.

The mast had undergone a maintenance inspection a few months before the collapse. The inspection did not report any significant problems with the mast. The stay tensions were checked for compliance with the specifications and plumbness of the mast was measured. The inspection criteria was again based on level site conditions.

Component elements of the structure were modeled as geometrically nonlinear-linear elastic elements or geometrically nonlinear with material nonlinearity depending on the member application. The geometric nonlinear analysis procedure employed for these elements was the standard total lagrangian techniques. The nonlinear formulation considers large displacements, large rotations and large strains. The variation of the element cross-sectional area with load was considered. The coordinate system for the model utilizes alternate local coordinate systems for the stays and TLE's to simplify input of coordinate data. The model geometry included the topography of the sloping site.

In formulating the computer model, it was determined that the most reliable data from the inspection reports was the measured stay tensions. Alternatively, the computer model could use the measured vertical position of the mast and allow the stays tensions to vary to "fit" the position of the tower. It was determined that the measured stay tensions was the most reliable information regarding initial conditions.

Successive analyses were done, increasing the weight density of the stays and TLE's to account for the effect of increasing snow accretion until a failure mechanism occurred. The resulting mechanism and collapse sequence was compared to the actual damage to the mast on the ground to verify the mode of failure.

Mark W. Fantozzi
The Fantozzi Company, Inc.
93 Devine Street
San Jose, CA 95110
USA

Heath Hollinsworth
TABA Limited
51 Osborne Villas
Hove, Sussex, BN3 2RA
United Kingdom



TELEFAX *id*
26 May 94

From: COMMANDER
U.S. Coast Guard Activities,
Europe
Hanover Court, Fourth Floor
5 Hanover Square
London W1R 9HE
Phone: 4471 872 0940
Telefax: 4471 872 0939

To: CDR DOUG TAGGART
COMMANDANT (G-NRN-1)
Fax No: 0101-202-267-4427

@ 1617

Reply to: LCDR Rob Loesch

Subj: PROFESSIONAL SOCIETY PRESENTATION ON LORSTA
KARGABURUN TOWER COLLAPSE ANALYSIS

COMMENTS:

Doug,

Please review the attached letters. The presentation will be made in 1995 so I don't see a conflict with the negotiations. If there is a conflict with the negotiation effort. Please let me know. The engineers involved are flexible, do understand international realities, but at the same time, they recognize that the information gathered at Kargaburun should be presented at a professional forum which deals with tall towers in a timely manner to have the best impact. If I could have a response back by end of next week, this would ensure that the professional engineers involved receive a timely response.

Thanks, Rob

Rob M. Loesch
27 May 94



11000

MAR 18 1994

From: Commander, Coast Guard Activities, Europe
To: Commandant (G-E)

Subj: INFORMAL INVESTIGATION INTO THE 25 FEB 93 TRANSMITTING
ANTENNA COLLAPSE AT LORAN STATION KARGABURUN, TURKEY

1. The subject report is forwarded for your approval. I concur with the Findings of Fact, Opinions and Recommendations of the Board and offer the following comments:

a. The thoroughness and professionalism of the investigation is noted and appreciated.

b. All nine Loran and three of four Omega towers/spans have been inspected since the collapse and inspection reports are complete. OMSTA Liberia tower inspection has been deferred until security conditions in the country improve.

c. ACTEUR continues to maintain an aggressive tower inspection and maintenance program. However, we have not contracted for tower inspections to the extent recommended by the investigation because of our 31 December 1994 closure. The report identifies a need to hire professional structural/tower engineers to complete full structural analysis on each tower in the Coast Guard in their as-built condition versus analysis of the design specifications. The specifications represent ideal conditions and do not compensate for on site conditions. From this analysis, correct tower inspection criteria can be developed. The analysis recommended may be beyond the capabilities of Coast Guard civil engineers/tower inspectors, given resource constraints and the multifaceted nature of their duties. Using contractors would allow for civilian professional input to the tower program.

d. I have directed procedures be implemented within ACTEUR to attempt to remove ice and snow from guys and radials by Loran Station personnel when such conditions exist and when practical.

e. While the odds of another tower collapse are small within ACTEUR our tower status remains essentially as it was before the Kargaburun collapse.

11000

MAR 18 1994

Subj: INFORMAL INVESTIGATION INTO THE 25 FEB 93 TRANSMITTING
ANTENNA COLLAPSE AT LORAN STATION KARGABURUN, TURKEY

2. I request authority to share this report with foreign
governments involved with the Loran-C program.

LAURENCE H. SOMERS

Encl: (1) Informal Investigation Report

Copy: COMDT (G-NRN)
COGARD MLC PAC ALAMEDA, CA (s)
COGARD CEU HONOLULU HI (Mr Heu) (W/O ENCL)
COGARD ACTEUR LONDON, UK (CDR Hathaway, LCDR Loesch) (W/O ENCL)