ARMED SERVICES BOARD OF CONTRACT APPEALS

Appeals of --	)	
	)	
NavCom Defense Electronics, Inc.	)	ASBCA Nos. 50767, 52292, 52293,
	)	52294, 52295, 52296
Under Contract No. N00019-88-C-0228	)	52297, 52298

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OPINION BY ADMINISTRATIVE JUDGE TING

In May 1995, NavCom Defense Electronics, Inc. (NavCom) submitted a Request for Equitable Adjustment (REA) to the contracting officer (CO). The 720-page REA sought $11,338,676 under 13 claims. The REA and its supporting documentation were presented in 17 volumes. In her letter dated 18 February 1997, the CO found partial entitlement on Claim No. 11 which dealt with specification errors, mistakes and omissions, but was unable to determine the quantum of adjustment. The CO also found partial entitlement in the amount of $39,213 for Claim No. 9, relating to Level of Repair Analysis. By letter dated 24 March 1997, NavCom submitted a certified claim in the amount of $13,435,058, incorporating the facts and arguments set forth in the REA. The CO did not respond.

Pursuant to 41 U.S.C. § 605(c)(5), NavCom filed an appeal by letter dated 23 May 1997 "as a result of the Contracting Officer's failure to issue a decision, or advise of her intent to so do" (23 May 1997 notice of appeal). The Board docketed the appeal on 27 May 1997.[1]

We decide entitlement and quantum.

GENERAL FINDINGS OF FACT[2]

Background

1. These appeals concern the production of IFF Radar Test Sets (RTSs). "IFF" stands for "Identification of Friend or Foe." It is a nomenclature developed during World War II. In an IFF radar system, a ground or airborne interrogator sends out a signal. The transponder at the receiving end recognizes the signal, and identifies itself by responding with a specific signal. The primary use of IFF systems today is for civil aviation traffic control purposes. (Tr. 1/87-89, 141)

2. As of 1982, the Government had been using an RTS known as the AN/UPM-137A (the 137A RTSs). The 137A RTS was an analog device. It operated manually. The user set all of the controls by "switches and knobs" on the front panel. (Tr. 1/105) By 1982, the 137A RTSs had become increasingly unavailable for use because they were "either out of calibration, in need of repair, or ashore, being calibrated/repaired" (ASR4, tab 648 at 2).

3. To replace the 137A RTS, the Government awarded two research and development (R&D) contracts in 1982 to develop the next-generation RTSs. One R&D contract was awarded to Hazeltine Corporation (Hazeltine). The other R&D contract was awarded to the NavCom Systems Division of Gould, Inc. (Gould), NavCom's predecessor.[3] (ASR4, tab 648) Gould's background and experience in the design, development and production of military electronics hardware equipment dated back to the 1940s. It had designed, developed and produced 12 different types of test sets which were used by DOD and free world nations. (R4, tab 18) By virtue of this background, we find that NavCom knew what was adequate in terms of proof of concept in an R&D environment and what was required in terms of mass production for actual use.

4. The R&D models, initially designated as the AN/UPM-( ) RTS until permanently nomenclatured, were designed to be less expensive than the 137A RTSs, using state-of-the-art operational enhancements with higher reliability (tr. 1/102-03; ASR4, tab 648 at 2). Hazeltine's R&D models were subsequently nomenclatured as AN/UPM-150 (tr. 2/241). NavCom's R&D models were subsequently nomenclatured as the AN/UPM-149 (tr. 1/103). To be consistent with the record, NavCom's R&D units will be referred to as the "149 RTSs" and NavCom's R&D contract will be referred to as the "149 Contract."

The 149 Contract

5. NavCom was to perform the 149 Contract to the requirements of Military Specification ELEX-T-457A, dated 19 March 1982. ELEX-T-457A covers the IFF test sets for both ship and shore installations for calibration and testing of interrogators, transponders, and other components of the Air Traffic Control Radar Beacon System (ATCRBS) IFF MK XII System (AIMs) (R4, tab 2 at 000123, ¶ 1.1; tr. 1/118). The R&D test sets called for by ELEX-T-457A incorporated newly developed technologies such as microprocessors and software, and had self-test and visual display capabilities. They represented a "quantum leap" from the 137A RTSs. (Tr. 1/105)

6. The 149 Contract contained certain "Design to Cost" requirements (R4, tab 1 at 000039, ¶ 3.17; tr. 1/106). NavCom understood the Government to have wanted an RTS that can be produced for no more than $45,000.00 (tr. 3/113-14).

7. The 149 Contract contained an option provision which would have permitted the Government to go directly from producing the 149 Engineering Development Models (EDMs) to manufacturing production units (tr. 1/219-20).

8. With the cost goal and production option in the 149 Contract, NavCom believed that "[t]he development program was not just going to be a proof of concept, but . . . would really be a preproduction unit so that the Government could go immediately into production following the [149] contract" (tr. 1/107).

9. The task of managing the development of NavCom's R&D units was assigned to Robert Rand (Rand) who joined the company in 1979 (tr. 1/89). Rand put together a team whose members reported to him directly (tr. 1/94-97). Robert Kuthe, system engineer, "played a very leading role in the development" of the 149 EDMs (tr. 1/97). Rand maintained total control of the R&D effort from a program, business and technical standpoint (tr. 1/129-30). He testified "there was never any information that was disseminated to the Government or received from the Government" that he did not know about (tr. 1/131).

10. Under ELEX-T-457A, NavCom's EDMs had to undergo "Level A" performance tests. The purpose of Level A tests is to "validate a baseline specification and performance of equipment for production" (tr. 1/162). ELEX-T-457A set forth the requirement as follows:

> 4.4.3 Level A performance tests. The equipment shall be subjected to Level A performance tests to ensure that all functions and modes of operation of the equipment are evaluated and are in compliance with the electrical requirements of 3.7.

(R4, tab 2 at 000161)

11. Level A tests pertained only to the electrical performance tests of the specification. They do not pertain to the "environmental tests" of the specification such as temperature-humidity test, vibration and shock tests. (Tr. 2/209-10, 4/120-21, 5/12)

12. ELEX-T-457A's "Acceptance inspection" tests are summarized in Table III of the specification. The table has three columns. The first column lists the tests (*e.g.*, "Temperature and humidity"). The second column lists the specification paragraphs which

required the tests (*e.g.*, ¶ 3.3.1) and the third column lists the specification paragraphs which set out the pertinent test methods (*e.g.*, ¶ 4.4.6). (R4, tab 2 at 000160)

13. NavCom internally approved a 428-page test procedure for the 149 test units on 29 November 1984. This document specified "in detail tests required to determine that the performance of the Test Set, Radar, AN/UPM-149 meets the requirements of specification ELEX-T-457A, 19 March 1982, Level A tests under standard environmental conditions." (R4, tab 33 at 002910, 002918; tr. 1/161) This test procedure was approved and accepted by the Government (tr. 2/118). There was "a lot of give and take" from those involved to ensure that "this document will indeed do what it's supposed to do" (tr. 1/162).

14. NavCom designated the first R&D test set as "EDM I," and the second R&D test set as "EDM II" (tr. 1/196). Testing on EDM I was performed between 6 and 17 May 1985. The minutes of testing stated, in part:

> 5. The testing performed on EDM # 1 during the period of 6 May 85 through 17 May 85 has validated all specification performance compliance without exception except as noted above.
> 6. It is understood that the Government will re-test the EDM's [sic] to also validate complete specification performance compliance at NESEA/NRL.

(Ex. A-6000; ASR4, tab 635; tr. 1/191, 201)

Environmental Testing Under The 149 Contract

15. Paragraph 3.3 of ELEX-T-457A pertains to "Environmental conditions." Paragraph 3.3.1, "Temperature and humidity," provides:

> Except as otherwise specified herein, the equipment shall conform to the temperature requirements of MIL-T-28800:
>
> a. Operating: 0° Celsius (C) to 55° C.

(R4, tab 2 at 000125-126) Paragraph 6.1 of ELEX-T-457A pertains to "Intended use" of the RTSs. It states that "[t]he equipment covered by this specification is intended for use as a bench-top instrument on board Naval ships or in environmentally controlled service areas." (R4, tab 2 at 000165). NavCom believed that the RTS would "probably operate somewhere around 20 to 25 degrees C" (tr. 1/149). Although ELEX-T-457A required a full range of environmental testing, the test procedures for the R&D units required testing only at ambient temperature (tr. 2/164). NavCom was more than a year late in delivering the

EDMs. By that time, the Government R&D budget had run out and it was negotiating with NavCom on what it could get out of the contract to bring it to a close. As a result, not all of the environmental tests were conducted. (Tr. 4/121-22) NavCom performed tests under what it considered to be "real world conditions" of 20° to 50° C, and not under the temperature extremes called for by the specification (tr. 3/99).

16. EDM II was tested between 12 and 22 November 1985. Three separate test phases were covered. NavCom was required to perform a Level A test procedure following environmental testing to provide confidence that environmental testing had not induced subtle failures in the test set. The second phase involved maintainability demonstration. The third phase involved a demonstration of NavCom's ability to meet calibration requirements. (ASR4, tab 577) The 137A RTS required over 40 hours to calibrate. ELEX-T-457A required the R&D models to be capable of being calibrated in one hour or less with a design goal of 30 minutes or less (R4, tab 2 at 000129). During testing of EDM II, NavCom reduced calibration time to 50 minutes using an automated calibration procedure. (ASR4, tab 577, 603; tr. 1/206) Testing of EDM II was satisfactorily concluded on 22 November 1985 (ASR4, tab 577).

17. While witnessing the EDM testings, Government representatives observed that although NavCom was meeting the approved test procedures, it was not meeting the requirements of ELEX-T-457A. This observation was brought to the attention of NavCom. (Tr. 2/158, 160) For example, among other nonconformances, NavCom's EDMs were exceeding the weight limitation and drawing more current than the specification allowed (tr. 4/131). The guidance the Government test inspectors received from management was, "This was an R&D program and if [NavCom] met the test procedure, we had to accept it" (tr. 2/158-59).

18. Because NavCom was a year late in delivering the EDMs, the Government ran out of money, and decided to terminate the R&D program. Consequently, the Government deleted certain tests such as the electromagnetic interference (EMI) testing (tr. 1/200, 5/14). With respect to the degree of testing on the R&D units, NAVAIR headquarters was satisfied that "[NavCom] had basically demonstrated that they could perform the concepts that they were looking for" (tr. 2/163). The Government accepted the 149 EDMs as having fulfilled the requirements of "an exploratory, experimental engineering device and [they] proved feasibility" (tr. 2/40).

19. Melvin J. Daugherty (Daugherty), a Navy civilian employee at the Naval Research Laboratory (NRL) with 40 years of experience with IFF systems (tr. 2/6-7), testified that the 149 Contract was satisfactorily concluded as a development vehicle, but the tests performed were "really inadequate to qualify . . . as a production unit" (tr. 2/52-53). He testified that, had the Government wanted to exercise the production option under the 149 Contract, testing would have been more comprehensive than the ones conducted (tr. 2/51-52). James Blaylock, a senior technician at the Naval Electronics

Systems Engineering Activity (NESEA) who later became the technical engineer on the test set program, compared the Level A testing conducted on NavCom's EDMs with "spot check[ing]" several stations on a car radio to get "a reasonable assurance" that stations would come in (tr. 4/119-20, 124). We find that the EDMs were never tested to the point where full scale production could be undertaken.

NRL/NESEA Testing Of The 149 EDMs

20. After the R&D units from NavCom and Hazeltine were delivered to the Government, the Government continued to run tests (tr. 2/16, 19, 151, 4/132). The purpose of conducting further in-house testing was to learn from the R&D models and to refine the existing specification before undertaking the procurement of production units (tr. 2/18, 40-41). The in-house testing effort was divided between NRL and NESEA. NRL conducted further testing on the radio frequency (RF) portion of ELEX-T-457A. NESEA performed tests on the rest of the specification including digital and computer interface. (Tr. 2/16-17, 151) NavCom understood that the Level A testing was not comprehensive and the Government would conduct further operational testing after the EDMs were delivered (tr. 1/200). We find those from NavCom involved with the 149 Contract did not expect that the results of Level A testing would establish the testing criteria for subsequent RTS production units.

21. NRL did not repeat the same tests that were performed at NavCom during Level A testing. It tested power and frequency accuracy over the range specified in the 149 Contract and found failure to meet specification requirements. (Tr. 2/48-49) The results of the NRL testing were set forth in a technical memorandum dated 10 June 1986, entitled "Technical Evaluation of the RF Portion of the AN/UPM-149 IFF Test Set" (ASR4, tab 551 at 010330-384). Testing at NESEA showed there were areas of concern, including accuracy in the measurement of RF. Blaylock testified:

> The problem we saw with that was sometimes I had to enter 5.8 volts to get five volts. I mean, it's kind of like you have to tune your radio to 101.1 to listen to 99.5.

Blaylock testified that while this was acceptable for the R&D units, it would not have been acceptable for the production units. (Tr. 4/133) NESEA combined its report and that from NRL and forwarded the two reports to the Space and Naval Warfare Systems Command[4] by a 24 June 1986 memorandum (ASR4, tab 551).

22. Both Blaylock and Daugherty believed it would have been useful to share with NavCom the results of the NRL/NESEA testing on EDM I and EDM II. Sharing the reports would identify for NavCom the problems NRL and NESEA had found which were not tested during Level A testing. (Tr. 2/147, 4/137-38) NavCom, however, never received the

NRL/NESEA reports because the reports were never finalized and signed out by the proper authority within the Government (tr. 2/151, 4/136-37).

23. During the course of the 149 Contract, it became clear to the Government that the EDMs would not meet the requirement for IFF test sets in the field. Shortly thereafter, the Government began to refine ELEX-T-457A. (Tr. 4/122-23) Within the Government, ELEX-T-457A was constantly being updated. Changes made to the specification (about three times a year) were shared with both NavCom and Hazeltine from time to time (tr. 4/142). Although the NRL/NESEA reports might have been of "some value" to NavCom, Blaylock testified "we were sharing all of the specs with them on a continuous basis. So they were certainly capable of seeing from our specification changes the problems we were concerned with." (Tr. 4/137-38)

24. NavCom had a breadboard which was an early, rough and crude model of the 149 EDMs. The breadboard had all of the modules on the EDMs and it had the capability of measuring pulse frequency. (Tr. 4/37-39) We find that NavCom could have run the tests NRL and NESEA ran on its breadboard.

25. From ELEX-T-457A and various in-house tests it conducted at NRL and NESEA, the Government prepared MIL-T-24664(EC) for the production contract (tr. 2/200, 258, 4/143-44).

26. NavCom's systems engineer Kuthe visited NESEA on 24 May 1986. The purpose of his visit was to "review [the Government's] latest production specification, review [NavCom's] EMI test results, and to clarify any questions regarding the specification." The new specification was MIL-T-24664(EC), dated 28 May 1986. With regard to this specification, Kuthe's trip report stated "there were basically no new requirements in the new spec. The spec[.] had been reorganized to put requirements in a more logical manner" (R4, tab 62).

27. A year later, Government representatives visited Hazeltine and NavCom to acquaint them with the latest additions to the specification (tr. 2/257). These trips were necessary because the Government had planned an ambitious schedule for the upcoming production contract requiring the successful contractor to deliver a first article in 16 months and begin production in 22 months. Daugherty and Blaylock visited NavCom on 27 May 1987. "[NavCom] personnel were given copies of the now-firm specification amendment" and there was an item-by-item discussion. (ASR4, tab 553; tr. 2/35, 177, 3/112) The specification changes resulting from the NRL/NESEA tests were discussed line-by-line at the meetings (tr. 2/258).

Procurement of Production RTSs

28. The Acquisition Plan for the procurement of production RTS units was approved in March 1987. It described the RTS to be procured as "a versatile, high performance microprocessor-based unit designed to provide complete testing of all segments of an AIMS XII IFF system." (R4, tab 3; tr. 3/5) The Justification and Approval limiting competition between Hazeltine and NavCom was approved in August 1987 (ASR4, tab 657; tr. 2/243).

29. The Government issued the RFP (No. N00019-87-R-0140) for the production RTS units on 2 December 1987. The RFP required the contractor to deliver, among other items, 507 AN/UPM-( ) Test Sets and 992 Interface Cable Assemblies (ICAs). The Government subsequently referred to the ICAs as Analog Controller Multiplexers (ACMs). ICAs will be referred to as ACMs in this decision (R4, tab 15 at 000720-723). The RFP included as Attachment (1), MIL-T-24664(EC) dated 28 May 1986. This version of the specification was identical to the version NavCom received from the Government in May 1986 (tr. 3/191). The RFP also included as Attachment (2), "CHANGES to MIL-T-24664(EC)" dated 10 July 1987 (R4, tab 15). The RFP required each vendor to address in its proposal the specific changes to its R&D units (tr. 2/174-75, 3/146, 4/146).

30. By the time NavCom was working on its proposal, Rand had left the company (tr. 1/225). James Van Cleave (Van Cleave) who joined the company in May 1987, was to manage the production contract, if awarded (tr. 3/56, 63, 4/8). In preparing to submit a proposal, Van Cleave met with Rand's IFF team which was "essentially intact" at the time (tr. 3/108). He did not consult with Rand (tr. 4/9). Anticipating a late July 1987 RFP release date, Van Cleave reorganized the Rand team, and began to implement cost reduction tasks that had been identified (tr. 3/131-32, 142; GSR4, tab 1088 at ¶ 18).

31. In preparing its proposal, NavCom used the specification it was given on 27 May 1987 as well as the specification and changes included in the December 1987 RFP (tr. 3/144). Van Cleave considered MIL-T-24664(EC) to be simply a "revision of the [ELEX-T-457A] that was used on the 149 contract" (tr. 3/136). He considered the specification for the 149 Contract and the production contract as essentially the same with some differences (tr. 3/145). He considered the 16-month schedule for completion of the first article testing and report "doable but it would take a lot of hard work and a little bit of luck." He considered 22 months a more realistic time frame. (Tr. 3/149-50)

32. In late April 1988, Van Cleave sought from his company an Anticipatory General Order (AGO) to fund in advance of award engineering efforts deemed necessary to reduce NavCom's schedule risk. Assuming an award date of 31 July 1988, he sought $354,000 for May, June and July 1988. This expenditure was said to have been necessitated by the design changes undertaken by both NavCom and the Government resulting in what Van Cleave considered to be "a new product baseline for the production

program which has created schedule risk due to the design cycle time required." (GSR4, tab 1132) In October 1988, Van Cleave sought to increase the AGO by $68,778, to $423,134, representing six man-months of labor for two months (GSR4, tab 1138; tr. 4/49-50). NavCom extended the AGO yet again in January 1989, increasing the amount by another $10,000 to $433,134 (GSR4, tab 1142). The fact that NavCom spent over $433,000 and 9 months to get ahead of the 16-month FAT schedule reflects a recognition on its part that there were enough differences between the EDMs and the production units to warrant this effort.

33. In response to the Government's RFP, NavCom by letter dated 16 February 1988, submitted a technical proposal. The letter stated that the proposal was "in full compliance" with the requirements of the RFP and its amendments. The letter also stated that, in response to the Government's recommended RTS changes in 1986 and in preparation for the competition, it had launched "a major in-house program to cut cost, weight, and complexity to result in a highly producible, reliable, low cost Radar Test Set." The letter reminded the Government that although NavCom had priced a first article program in its proposal, the Government had the right to waive first article testing and approval pursuant to Special Provision M-1.[5] In lieu of first article testing, NavCom recommended "requalification of the design by similarity to that previously qualified." (R4, tabs 17, 18 at 001637; tr. 3/203) In this case, the Government chose not to waive first article testing and approval (tr. 3/36-37).

NavCom's Proposal

34. NavCom's EDMs under the 149 Contract were 20 pounds overweight. NavCom proposed to change out the display assembly to alleviate the problem (tr. 3/120).

35. Paragraph 4.0.1.2 of NavCom's technical proposal sets forth its "Proposed Differences Between R&D Test Set and Production Test Set." Table 4.0.1.2-1 provides a "Summary of Changes" (R4, tab 17 at 001409-11).

36. Paragraph 4.3 of NavCom's technical proposal pertains to "Environmental Conditions." It states, in part:

> The production Test Set is of similar design and will meet all the environmental requirements of the specification, including the requirements of MIL-T-28800 for Type 1, Class 3, Style C equipment.[6]

(R4, tab 17 at 001430) Van Cleave testified that this paragraph was "to make sure that the government understood that what we [NavCom] were offering was exactly the same performance as the UPM-149 from [sic] the environment conditions. That there were no differences" (tr. 3/209).

37. Paragraph 4.3.4 of NavCom's technical proposal pertains to "Shock." It provides, in part:

> The NavCom R & D Test Set was tested and passed the Shock Test requirement of the specification. To assure passing this test with the production units, the Test Set will be of a similar design and engineering shock studies will be conducted during the production design phase.

(R4, tab 17 at 001436) Van Cleave testified that, with this statement, NavCom "wanted to make sure . . . that the government understood that what they were getting was exactly what they accepted under the UPM-149" (tr. 3/209-10).

38. NavCom's proposal also made changes to the "Calibration Design Features":

> Several design improvements have been made in the rf section for ease of calibration. Six rf modules have been merged into three functional modules. This reduces many frequency dependent error sources due to inter module cable interfaces. Merging the scaler and demodulator reduced the complexity of the rf input signal measurement path thus reducing anomalies that were previously present in the frequency response of this path. By doing this, the path losses become predictable, less calibration data are required for rf power measurement and frequency measurement accuracy, and linear interpolation can be used between data points. Combining the main and auxiliary modulators simplifies the rf output path especially for the combined main and auxiliary output function.

(R4, tab 17 at 001423) In addition to the main and auxiliary modulators, and the scaler and demodulator, NavCom also proposed to merge the 1030 and 1090 RF generator modules. In merging six modules into three, NavCom's proposal kept the calibration points on the production RTSs the same as the R&D EDMs (tr. 4/59; R4, tab 17 at 001411).

39. Prior to submitting its proposal, Van Cleave also reviewed the Level A test procedures used under the 149 Contract. Based on his impression that the Level A testing was "very thorough and very elaborate," Van Cleave formed the opinion that "[t]he performance requirements . . . were essentially the same . . . for both [the] 149 and [the] 155 [Contracts]" (tr. 3/221). The evidence shows the Level A testing of the R&D EDMs to have been neither thorough nor elaborate. Testing was constrained by both time and budget. Moreover, in light of the specification changes as well as NavCom's design modifications, we find NavCom's proposal team equally unrealistic in concluding the performance

requirements under the 149 R&D contract and the production contract to be essentially the same.

40. Because it believed it would be able to use essentially the same test procedures used on the 149 Contract, NavCom evaluated the technical risks on the production contract as low (tr. 4/40). Based on our finding that (1) the EDMs delivered under the 149 Contract was not fully tested, (2) numerous specification changes had been made to ELEX-T-457A, (3) numerous design changes had been incorporated in NavCom's technical proposal, and (4) the Government required for first article testing and approval prior to production, we find NavCom's risk assessment unrealistic.

41. The Government had two major concerns about NavCom's proposal. First, the proposal did not indicate that the same people who had been involved with the R&D effort would be involved with production. This was of concern because the Government believed that NavCom had to have "continuation of knowledge" in order to successfully transition into production. Second, the Government was concerned about NavCom's proposal to combine the RF modules. This was a concern because of the possibility of introducing problems into the RF circuit since NavCom had difficulties in meeting the RF accuracy requirements during its R&D effort. (Tr. 4/148-49) NavCom assured the Government that it intended to bring "those people from the R&D program into the production program." On combining the RF modules, NavCom assured the Government that it had already "done this in-house" and "tested it in the brassboard." The Government accepted NavCom's assurances. (Tr. 4/150-51; R4, tab 23)

42. Both Hazeltine's and NavCom's proposals were found technically acceptable. Hazeltine was the low offeror. It was, however, debarred as a result of the Ill Wind investigations. Consequently, NavCom was awarded the RTS production contract, Contract No. N00019-88-C-0228, on 3 February 1989. (Tr. 2/244-45, 4/29; R4, tab 26) NavCom's production units have since been nomenclatured as the AN/UPM-155 test sets. To be consistent with the record, NavCom's production contract will be referred to at times as the "155 Contract," and the RTSs produced under the contract as the "155 RTSs."

43. The 155 Contract was in the firm fixed-price of $37,502,676 (R4, tab 26 at 001960). It required NavCom to deliver, among other items, 501 RTSs and 926 ACMs (R4, tab 26 at 001941-54).

ANALOG CONTROLLER MULTIPLEXER (ACM)

FINDINGS OF FACT (affecting Claim Nos. 1, 3, and 7)

44. Since the issue of whether the ACMs were a part of the First Article Unit required to be subjected to first article testing affects several claims (Claims Nos. 1, 3, 7), we decide this overarching issue first. On the 149 RTS, all of the active circuitry for auto-

testing was housed on a circuit board inside the RTS. The cable that connected the RTS to the Unit Under Test (UUT) was the only thing that was external to the 149 RTS. (Tr. 8/151) After Hazeltine delivered its R&D units, the Government realized that "people wanted more autotest functionality." After considering many alternatives, the Government decided to house the active circuitry outside the RTS. (Tr. 8/150) Removing the active circuitry from within the RTS to an ACM external to the RTS was a major change associated with the 155 production contract. (Tr. 3/8, 74, 7/8)

45. The ACM NavCom proposed for the 155 Contract was a black box with a metal base and a plastic cover. It contained a circuit board and used external cables to interface with the RTS and the UUT. (Tr. 7/8, 8/149) Without the ACM, it is not possible to test UUTs in an autotest mode (tr. 9/96).

46. Part I of the 155 Contract contains the contract "SCHEDULE." Section C of the contract schedule sets out the work statement which, at Item 0001, specifies "First Article Contractor Testing," and defines "A First Article Unit":

> Item 0001 - The First Article Contractor Testing called for hereunder shall be performed in accordance with Attachment (1) . . . ". . . MIL-T-24664(EC) dated 28 May 1986" and Attachment (2) "Changes to MIL-T-24664(EC) dated 29 April 1988" and the Section H special contract requirement entitled "First Article - Contractor Testing".
>
> A First Article Unit for this contract is defined as consisting of:
>
> one (1) each AN/UPM( ) Test Set
> one (1) each [ACM] for AN/UPX-23 and AN/UPX-27

The paragraph goes on to list six other different and specific ACMs as a part of the "First Article Unit." (R4, tab 26 at 001961; tr. 3/231-32)

47. Section H-4 of the contract "SCHEDULE" referenced in Item 0001 contains FAR 52.209-3 FIRST ARTICLE APPROVAL - CONTRACTOR TESTING (APR 1984) And ALTERNATE I (APR 1984) and ALTERNATE II (APR 1984). It provides in part:

> (a) The Contractor shall test five (5) unit(s) of Item 0001 *as specified in this contract*.

(Emphasis added) (R4, tab 26 at 001996)

MIL-T-24664(EC)

48. Schedule C, Item 0001 of the 155 Contract refers to MIL-T-24664(EC). Paragraph 1.1, "Scope.," of MIL-T-24664(EC) provides:

> . . . This specification covers the Radar . . . Test Set, AN/UPM-( ), hereinafter referred to as the equipment. The equipment is to be designed for both ship and shore installations for calibration and testing of interrogators, transponders . . . .

(R4, tab 26 at 002203; tr. 4/282) Since ¶ 1.1 refers to the RTS alone and not to the ACMs as the equipment, NavCom contends that the testing specified in MIL-T-24664(EC) does not apply to the ACMs because the ACMs are not equipment (tr. 3/233-34, 4/245-46).

49. Paragraph 4.3, "First article inspection.," of MIL-T-24664(EC) provides, in part, that "First article inspection shall consist of all examinations and testing necessary to determine compliance with the requirements of this specification. First article inspection shall include the tests specified in TABLE III." Table III sets out five columns. The first column lists the "Examination or test" required. The second column identifies the specific paragraph of the specification which required the examination or test. The third column identifies the specification paragraph which details the examination or test. The fourth column marks with an "x" those tests subject to first article inspection. Table III shows that "Environmental" testing includes temperature and humidity, salt atmosphere, altitude, high impact shock, and vibration. It also shows EMI testing to include 11 tests, among them, leakage current, voltage and frequency variation, reliability, and maintainability. (R4, tab 26 at 002236)

Accessories

50. NavCom contends that ACMs are accessories. Table III shows that ¶ 3.4.1.5, "Accessories.," required first article inspection, and the first article inspection was required to be conducted in accordance with ¶ 4.5.2. (R4, tab 26 at 002206)

51. Paragraph 3.4.1.5 provides that "Accessories and accessory storage shall be provided as specified in 3.4.1.5.1 through 3.4.1.5.9." Paragraph 3.4.1.5.1 pertains to "Accessory Stowage." It provides:

> The portable equipment front panel cover shall be provided with a means for stowage of items specified in a through f:
>
> a. Cables
> b. Adapters and probes
> c. Operator's manuals

d. Spare bulbs
e. Extender board(s)
f. At least two [ACMs]

The method of stowage of the accessories shall be subject to the approval of the procuring activities.

(R4, tab 26 at 002206; tr. 9/60) Government witness (Blaylock) testified that this paragraph was the Government's "straightforward attempt to say that we wanted the accessory stowage compartment large enough to be able to put two ACMs in it, and that's not interpreting them as accessories" (tr. 9/62).

52. Paragraphs 3.4.1.5.2 through 3.4.1.5.9 define what constitute accessories under MIL-T-24664(EC). Accessories are: Video test probe (¶ 3.4.1.5.2), RF cables (¶ 3.4.1.5.3), General services cables (¶ 3.4.1.5.3.1), High power cable (¶ 3.4.1.5.3.2), RF jumper cable (¶ 3.4.1.5.3.3), General service cables (¶ 3.4.1.5.4), Adapters (¶ 3.4.1.5.5), Terminations (¶ 3.4.1.5.6), Service test cable (¶ 3.4.1.5.7), Extender board(s) (¶ 3.4.1.5.8), and Primary power cables (¶ 3.4.1.5.9) (R4, tab 26 at 002207). These paragraphs do not list ACMs as accessories (tr. 4/247, 9/62).

53. NavCom did not submit any ACMs as accessories. The only accessories NavCom submitted for inspection were those associated with ¶¶ 3.4.1.5.2 through 3.4.1.5.9 above in accordance with ¶ 4.5.2 of MIL-T-24664(EC) (tr. 9/62). Paragraph 4.5.2 of MIL-T-24664(EC) requires accessories to be subjected to:

> 4.5.2 Preoperational inspection. Each equipment shall be examined for workmanship; assembly and fit; mechanical mounting; electrical connections; . . . .

(R4, tab 26 at 002237)

54. A Preliminary Program Review (PPR) meeting was held at NavCom from 22 to 24 May 1989. The issue of whether the ACMs were subject to the various first article tests was brought up at this meeting. NavCom contended that the ACMs were not subject to environmental testing. The Government researched the question overnight and took the position that they were. (Tr. 8/163-64) Daugherty's 9 June 1989 memorandum of the meeting reported:

> Nav Com [sic] somehow had concluded that the [ACMs] were not included in the equipment as defined in the specification and therefore not subject to full environmental testing. It was shown to them that the [ACMs] are full-fledged

> "equipment" and must therefore be subject to the same environmental testing.

(R4, tab 698 at 000226; tr. 8/165) The issue was not resolved at the meeting (tr. 8/164). The Government gave NavCom "an action item to come back . . . with . . . [a] written proposal on what to do about it" (tr. 8/167).

55. NavCom's 6 July 1989 letter proposed that environmental testing, including temperature and humidity, altitude, vibration and salt atmosphere testing be performed on one representative ACM only. The letter said that the APX-72 had been selected and government approval was requested. (GSR4, tab 1161)

56. The Government did not believe testing only one out of seven ACMs would be adequate. Each ACM had unique cables. The ACMs had four unique circuit boards. Each circuit board had a different electronic component called a PROM. (Tr. 8/170-71) In her 26 October 1989 letter to NavCom the CO stated that "Environmental testing of the [ACMs] should include all contractually imposed tests and be performed on all [ACMs] in accordance with the contract." The letter asked for "justification for . . . the NavCom recommended approach and the position that the [ACM] for the APX-72 is representative of all [ACM] units on the contract." (Ex. A-6007; tr. 8/172)

DECISION

THE ACMs ARE A PART OF THE "FIRST ARTICLE UNIT"

One of the major differences between the 149 Contract and the 155 Contract is the ACMs. There is no dispute that under the 155 Contract, the RTSs were subject to first article testing. NavCom contends, however, that the ACMs were not a part of the first article unit, and therefore not subject to first article testing. This issue of contract interpretation impacts several claims. It is at the heart of Claim Nos. 2 and 6, relating to first article procedures and hardware development, to Claim No. 1, relating to EMI, and to Claim No. 3, relating to the ACM drop test. NavCom contends that the ACMs are "accessories" and not subject to the same first article environment and EMI tests as the 155 RTS; the Government contends that the ACMs and the 155 RTS together constituted a "first article unit" and therefore the ACMs are subject to the same first article testing requirements as the 155 RTS.

In addition to defining a "First Article Unit" Item 0001, Section C of the 155 Contract schedule also provides that first article testing shall be performed in accordance with MIL-T-24664(EC) and its 29 April 1988 update. Since MIL-T-24664(EC) refers to the RTS alone as the "equipment," NavCom contends that the ACMs are not equipment and therefore not subject to first article testing. NavCom contends that the ACMs are accessories under MIL-T-24664(EC). Under Paragraph 4.3, "First article inspection.," the

only first article testing that Table III requires accessories to undergo are "preoperational inspection" prescribed by ¶ 4.5.2.

For its argument that the ACMs are accessories, NavCom relies on ¶ 3.4.1.5, "Accessories." This paragraph provides that "Accessories and accessory storage shall be provided as specified in 3.4.1.5.1 through 3.4.1.5.9." Provisions of a contract must be so construed as to effectuate its spirit and purpose. *Fort Vancouver Plywood Co. v. United States*, 860 F.2d 409, 413 (Fed. Cir. 1988). The principal apparent purpose of ¶ 3.4.1.5.1, "Accessory Stowage," is to require that the front panel of the RTS be of sufficient capacity to store at least two ACMs and five other items. The paragraph does not define ACMs as accessories. Paragraph 3.4.1.5.2 through 3.4.1.5.9 define what constitute accessories under MIL-T-24664(EC); they do not, however, mention or include ACMs. We conclude that the specification paragraphs NavCom relies upon provide no basis for the conclusion that the ACMs are accessories.

Furthermore, neither the Government nor NavCom considered ACMs as accessories during the course of contract performance. We have found that the only accessories NavCom submitted for inspection were those associated with ¶¶ 3.4.1.5.2 through 3.4.1.5.9, and NavCom never submitted any ACMs as accessories. Thus, we conclude that NavCom's argument that ACMs are accessories is of recent vintage, crafted in support of its litigation position. In *Macke Co. v. United States,* 199 Ct. Cl. 552, 467 F.2d 1323 (1972), the court found that the best evidence of contract interpretation is how the parties acted under the arrangement, before the dispute. The court found this evidence far more "revealing than the dry language of the written agreement by itself." *Id.* at 1325.

Nor does MIL-T-24664(EC)'s reference to RTS alone as equipment trouble us. The contract schedule refers to MIL-T-24664(EC) for testing requirements. MIL-T-24664(EC) does not define what constitutes the first article unit. Item 0001, Section C of the contract schedule does. To consider the RTS alone to be subject to first article testing would render certain portion of the 155 Contract superfluous and meaningless. An interpretation giving reasonable meaning to all parts of a contract will be endorsed over one that leaves portions of the contract meaningless. *Fortec Constructors v. United States,* 760 F.2d 1288, 1292 (Fed. Cir. 1985). We read the language of a particular contract provision in the context of the entire agreement. *United States v. Johnson Controls, Inc.*, 713 F.2d 1541, 1555 (Fed. Cir. 1983). In this case, the Government's interpretation that the term "equipment" as used in MIL-T-24664(EC) includes the RTSs and the ACMs leaves no portion of the contract void and meaningless. On the other hand, NavCom's interpretation would render the definition of what constitutes the "First Article Unit" in Item 000l of the contract schedule void and meaningless. NavCom's interpretation is therefore unreasonable.

Established court precedent and rules of construction require that contract provisions should not be interpreted as conflicting with one another unless there is no other

possible reasonable construction of the language. *Hol-Gar Mfg. Corp. v. United States,* 169 Ct. Cl. 384, 395, 351 F.2d 972, 979 (1965). While we see no conflict between the contract schedule and MIL-T-24664(EC), even if there were, such conflict would be resolved in favor of the Government's interpretation. The 155 Contract incorporated by reference the FAR 52.215-33 ORDER OF PRECEDENCE (JAN 1986) clause. This clause provides:

> Any inconsistency in this solicitation or contract shall be resolved by giving precedence in the following order: (a) the Schedule (excluding the specifications); (b) representations and other instructions; (c) contract clauses; (d) other documents, exhibits, and attachments; and (e) the specifications.

(R4, tab 26 at 002038) Thus, even if there is a conflict, the definition of Item 0001 of the contract schedule would take precedence over the specification (*i.e.*, MIL-T-24664(EC), ¶ 1.1). *See, e.g., Hensel Phelps Constr. Co. v. United States,* 886 F.2d 1296 (Fed. Cir. 1989); *Sperry Corp. v. United States,* 845 F.2d 965 (Fed. Cir 1988).

On this issue, the contract is clear. The FIRST ARTICLE APPROVAL - CONTRACTOR TESTING (APR 1984) and ALTERNATE I (APR 1984) and ALTERNATE II (APR 1984) clause provides that "[t]he Contractor shall test five (5) unit(s) of Item 0001 as specified in this contract." MIL-T-24664(EC) is not the "contract" referenced. Section C of the contract schedule, Item 0001, defines a First Article Unit as consisting of one RTS and one each of seven different and specific ACMs. Thus, both the RTSs and the ACMs are subject to first article testing.

CONCLUSION

Because the ACMs are not accessories as defined by the specification, and because NavCom's interpretation of the RTSs alone as the first article unit would render meaningless and superfluous the definition of the "First Article Unit" in Item No. 0001 of the contract schedule (which takes precedence over the specification), we hold that the ACMs are a part of the "First Article Unit."

ASBCA No. 52293 - Claim No. 1
ELECTROMAGNETIC INTERFERENCE (EMI) TEST
FINDINGS OF FACT[7]

1-1. Electronics fundamentals provide that any time there is "electricity flowing anywhere . . . there is radiation" (tr. 8/20). The ACMs contain active circuitry which is capable of emitting undesirable signals which can interfere with the performance of other equipment, or of conducting undesirable signals which can interfere with its performance

(tr. 7/12, 8/20, 176). These undesirable signals are called electromagnetic interference or EMI (tr. 7/10).

1-2. There are four kinds of EMI: Radiated Emissions (RE) are emissions from an electrical device that interferes with other equipment. Radiated Susceptibility (RS) is an electrical device's susceptibility to interference from other electrical devices. Conducted Emissions (CE) and Conducted Susceptibility (CS) are similar to RE and RS except that they involved conducted signals (*e.g.*, through power lines). (Tr. 7/10-12)

1-3. Electromagnetic compatibility or EMC is achieved when a piece of equipment and other equipment meet the specification for electromagnetic emissions and susceptibility. EMC is the science associated with looking at all the EMI test reports of all the equipment and determining whether there is an emission or susceptibility problem or EMC problem. (Tr. 7/15-16)

EMI Testing Requirements Under the 155 Contract

1-4. Paragraph 3.7, "Electromagnetic compatibility.," of MIL-T-24664(EC) requires that "[t]he equipment shall operate within the limits specified in MIL-T-28800" (R4, tab 26 at 002231). Paragraph 4.5.8, "EMI test.," identifies the EMI tests required. It provides that "[t]he equipment shall be subjected to an EMI compatibility test in accordance with the EMI test paragraph in MIL-T-28800." (R4, tab 26 at 002238) Paragraph 4.5.6.5 of MIL-T-28800, in turn, requires the contractor to comply with MIL-STD-461, which specifies the applicable EMI tests, and MIL-STD-462, which specifies the measuring equipment, set up, procedures, and operation of equipment during EMI testing (R4, tab 28 at 002772, 002823).

1-5. Paragraph 4.2.7 of MIL-STD-462 describes the arrangement and operation of test samples for EMI testing (ex. G-5005 at 26). Paragraph 4.2.7.2 of MIL-STD-462 provides:

> 4.2.7.2 Signal Inputs. - Actual or simulated signal inputs required to activate, utilize, or operate all circuits shall be used during emission and susceptibility testing.

(Ex. G-5005 at 26) Actual or simulated signals are signals that "the system would be utilizing during actual operation when out in the field" (tr. 9/92). Paragraph 4.2.7.3 of MIL-STD-462 provides:

> 4.2.7.3 Arrangement and Operating Conditions. - Interconnecting cable assemblies and supporting structures shall simulate actual installation and usage. . . .

(Ex. G-5005 at 26) Paragraph 4.2.7.5 of MIL-STD-462 provides:

> 4.2.7.5 Loads. - The equipment under test shall be loaded with the full mechanical and electrical load, or equivalent for which it is designed. . . .

(Ex. G-5005 at 27) This means that during EMI testing, the RTS "should be operated with a load that is consistent with the load that it will be utilizing during actual operation testing" (tr. 9/93).

EMI Testing Requirements Under the 149 Contract

1-6. Under the 149 Contract, ELEX-T-457A requires at ¶ 3.3.5 that "[t]he equipment shall operate within the limits specified in MIL-T-28800. . . ." (R4, tab 2 at 000126). This requirement is identical to the requirement set out in ¶ 3.7 of MIL-T-24664(EC) (tr. 7/32).

1-7. Under the 149 Contract, ELEX-T-457A required the following specific EMI tests:

> 4.4.8 EMI test. The equipment shall be subjected to an EMI compatibility test in accordance with the EMI test paragraph and TABLE IX of MIL-T-28800 for CE03, CS01, CS02, CS06, RE02, and RS03 tests.

(R4, tab 2 at 000163; tr. 7/32) According to the Government, the listing of the six specific EMI tests in ¶ 4.4.8 was "a tailoring of the requirement" for R&D purposes (ASR4, tab 739 at 003244).

1-8. Due to lack of funding EMI testing was not conducted by NavCom during the development of the 149 EDMs. After the 149 EDMs were delivered to the Government, the Government ran EMI testing. (Tr. 7/14; R4, tab 61) The Government tested all of the active circuitry within the RTS (tr. 8/178, 181). In addition to the 6 EMI tests specified by ¶ 4.4.8 of ELEX-T-457A (CE03, CS01, CS02, CS06, RE02 and RS03), the Government also ran tests for CE01, CE07, RE01, RS01 and RS02. (R4, tab 61) All of the EMI tests the Government ran were eventually required in the 155 Contract (tr. 7/18).

1-9. The Government's EMI test report showed that NavCom's 149 RTS failed the test for CE03 and RE02. Both of these were specifically specified for testing by ¶ 4.4.8 of ELEX-T-457A. The Government's test report recommended that NavCom's 149 RTS should not be considered for service use until it met the requirements of MIL-STD-461B for tests CE03 (narrow band), CE03 (broad band), RE02 (narrow band), and RE02 (broad

band). (R4, tab 61 at 004451) The Government transmitted its EMI test report to NavCom on 16 July 1986 (ASR4, tab 562).

1-10. When the Government subsequently issued the RFP for the 155 Contract, it revised the EMI test specification (¶ 4.4.8 of ELEX-T-457A) eliminating the specific reference to CE03, CS01, CS02, CS06, RE02 and RS03 tests. MIL-T-24664(EC) contains this revised paragraph:

> 4.5.8 EMI test. The equipment shall be subjected to an EMI compatibility test in accordance with the EMI test paragraph of MIL-T-28800. . . .

(R4, tab 15 at 001009; tr. 7/32) By eliminating the six specific EMI tests and referring broadly to MIL-T-28800, we find the Government invoked in the 155 Contract the full range of EMI tests required by MIL-T-28800 which, in turn, invoked MIL-STD-461 and MIL-STD-462 (*see* ¶¶ 3.9.11, 4.5.6.5, R4, tab 28 at 002772, 002823). NavCom acknowledged that if MIL-T-28800 was applicable, "then, yes, you do add those extra tests that are called out in MILT-2800 [sic]" (tr. 7/34). There is no evidence that the Government required any EMI tests beyond those called for in MIL-T-28800.

1-11. NavCom's 16 February 1988 proposal "assumed that the specific set of requirements identified as 'category A4' for shipboard equipment are applicable," and proposed EMI testing for CE01, CE03, CS01, CS02, CS06, RE01, RE02, RS01, RS02 and RS03 (R4, tab 17 at 001386). With the exception of CE07, these EMI tests covered all of the tests required by ¶ 4.4.8 of ELEX-T-457A plus the additional tests the Government conducted on its own. (Tr. 7/36)

Approval of EMI Test Plan and EMI Testing

1-12. On 4 April 1989, NavCom submitted its EMI Compatibility Control Plan (Control Plan) required by CDRL Item No. L001 of the 155 Contract. (R4, tab 63 at 00456-004502) In its Control Plan, NavCom proposed solutions to the CE03 and RE02 test failures experienced by the Government when it conducted the EMI testing on the 149 EDMs. (R4, tab 63 at 004492) The Control Plan did not mention EMI testing for the ACMs.

1-13. On 5 May 1989, NavCom submitted its EMI Test Plan required by CDRL Item No. L002. Table III, entitled "Test Set Equipment Under Test" listed the RTS and nine different assemblies. Table III did not list the ACMs as an "Equipment Under Test" (EUT) required to be tested. (R4, tab 65 at 004519)

1-14. The Government approved the EMI Control Plan by letter dated 18 May 1989 (R4, tab 64). In approving the EMI Control Plan, the approving authority did not notice NavCom's failure to address EMI testing for the ACMs.

1-15. During the PPR meeting held on 23 May 1989, the Government told NavCom that the ACMs were equipment and had to be subjected to all first article testing including EMI testing (ASR4, tab 697 at 000218).

1-16. On 7 June 1989, the Government approved NavCom's EMI Test Plan (R4, tab 66). There is no evidence that in approving the EMI Test Plan, the approving authority was aware of the disagreement between the parties with respect to first article testing of the ACMs raised in the May 1989 PPR meeting.

1-17. At the 6-8 February 1990 technical review meeting, Government representatives expressed surprise that NavCom's approved EMI Test Plan did not address the ACMs. At this meeting, NavCom agreed to incorporate the ACM EMI susceptibility testing into first article test procedures. (ASR4, tabs 778, 812)

1-18. At the Critical Program Review (CPR) meeting held on 13-15 March 1990, the Government recommended that NavCom resubmit the approved EMI Test Plan to incorporate the EMI test proposed during the 7 February 1990 technical review. NavCom indicated that it would comply but would submit the costs associated with the effort in an equitable adjustment proposal. (R4, tab 209 at 007180)

1-19. On 1 June 1990, four months after it was told that EMI testing of the ACMs was required, NavCom submitted Revision A to the EMI Test Plan. NavCom revised the test plan to include radiated susceptibility tests RS01, RS02 and RS03 for the ACMs. It added pages to the end of the test plan and did not otherwise change the original test plan. (R4, tab 68 at 004647-004701)

1-20. The Government reviewed Revision A for conformance with the requirements of MIL-STD-461 and MIL-SRD-462 (tr. 9/98). The Government's comments requested clarification and NavCom to include certain omissions. For example, NavCom failed to include the ACMs in Figure 1.1-2. The Government's comments asked NavCom to include the ACMs in the figure. (R4, tab 68 at 004612, tab 70 at 004711, ¶ 4) Similarly, NavCom failed to include the ACMs in Table III which listed the EUT. The Government's comments asked NavCom to include ACMs in Table III. (R4, tab 68 at 004616, tab 70 at 004713, ¶ 20) The Government forwarded its comments to NavCom by letter dated 10 October 1990 and stated that approval of the plan was withheld pending satisfactory resolution of the comments. (R4, tab 70)

1-21. NavCom acknowledged that it "agreed to accomplish the effort for Revision A at no cost, as a courtesy to the Government." Consequently, NavCom had not included the

costs for Revision A in its claim. NavCom's claim asserted that it did not agree to do subsequent revisions at no costs. (Claim at 153)

1-22. In response to the Government's comments on Revision A, NavCom submitted Revision B by letter dated 21 November 1990 (R4, tab 71). Although Revision B clarified some issues and answered some of the Government's questions, there were still some aspects of the test plan that needed clarification. For example, NavCom did not show in Figure 1.1-2 how the ACM would be hooked up to the unit tested. (R4, tab 71 at 004738)

1-23. In its comments to Revision B, the Government asked NavCom to revise its definition of EUT to include the ACMs, cables and connectors as required by MIL-STD-461 and MIL-STD-462 (R4, tab 72 at 004884; tr. 9/107-08). In accordance with MIL-STD-461 and ¶ 4.2.7.3 of MIL-STD-462, the Government asked NavCom to install the EUT "in the test chamber in a manner that will simulate service usage, utilizing connections and attaching instrumentation as necessary" (R4, tab 72 at 004888; ex. G-5005 at 26). The Government asked that during testing "[a]dditional dummy loads or covers not part of the EUT and not used during normal operation will not be used" (R4, tab 72 at 004888). In addition, the Government requested that the UUT, which consisted of the transponders and interrogators being tested be placed outside the shielded enclosure (R4, tab 72 at 004888). In its 13 May 1991 letter, the Government gave conditional approval to Revision B subject to satisfactory resolution of the comments forwarded. (R4, tab 72)

1-24. NavCom submitted Revision C of the EMI Test Plan on 19 August 1991 (R4, tab 73). The Government conditionally approved Revision C subject to placement of the ACM for all Radiated Susceptibility tests directly in front of the oscilloscope (R4, tab 74).

1-25. NavCom submitted Revision D by letter dated 12 December 1991 proposing to place the ACM on the bench next to the RTS (R4, tab 75). The Government agreed with this approach because the ACM "would receive a level of radiation consistent with that of the RTS" and consistent with the requirements of MIL-STD-461 and MIL-STD-462 (tr. 9/114-15).

1-26. Although the UUT is normally placed outside the testing room in accordance with MIL-STD-462, NavCom asked that it be permitted to place the UUT in the shielded room under the shielded bench to reduce the cost that would have to be incurred in obtaining a long cable to extend the system to the next room. The Government gave its permission on the condition that the UUT be shielded and grounded so that it would not corrupt the measurement of the EMI testing. (R4, tab 75) The Government approved Revision D of NavCom's EMI Test Plan on 6 January 1992 (R4, tab 76).

1-27. Actual EMI testing occurred over a five months (November 1991 - March 1992) period. The initial EMI testing took place between 1 and 13 November 1991. There

were failures of CE03 due to EMI filter concerns (tr. 9/121). NavCom determined that the RTS input power EMI filter had to be redesigned to meet CE03 test limits and terminated the test (GSR4, tab 1284 at Sheet 10). CE03 was the same test that was failed when the Government EMI tested the 149 EDM (R4, tab 61 at 004450). When NavCom submitted its EMI Compatibility Control Plan under the 155 Contract in April 1989, it had proposed to use a power line filter to fix the CE03 failures (R4, tab 63 at 004492). NavCom apparently failed to implement its own recommendation. A 4 November 1991 NavCom Engineering Weekly Highlights reported that "CE03 failed as expected" (GSR4, tab 1308 at 022184).

1-28. At the hearing, NavCom blamed the GFE (oscilloscope) as the source of the power line problem. According to the Government technician who witnessed the test, "the oscilloscope would be turned off to determine if the problem still existed" (tr. 9/126). Apparently, CE03 failures still occurred with the oscilloscope turned off. Thus, the power line problem was not attributable to the oscilloscope. In addition, NavCom's test report does not mention the oscilloscope as the source of the power line problem. (GSR4, tab 1284 at Sheet 10)

1-29. NavCom's EMI Test Report dated 27 March 1992 stated that during the test period 8 to 18 January 1992, "A complete EMI test was run successfully" (GSR4, tab 1284 at Sheet 11). NavCom alleged that the EMI testing that took place during this time was a "dry run" test (tr. 8/51). NavCom's claim seeks the cost of this "dry run" (Claim at 154-55). The test report did not characterize the January 1992 tests as a "dry run"; it characterized the tests as "[a] complete EMI test" (GSR4, tab 1284 at Sheet 11). There is no evidence that NavCom ran another complete EMI test to satisfy the contract requirement.

1-30. Subsequent to the successful EMI testing in January 1992, NavCom made minor design changes to the ACM EMI filter pin connector in the RTS front panel, and to the grounding and bonding design of the ACM. These changes took place between 25 and 27 February 1992. Notwithstanding NavCom's assertion that the design changes were directly related to EMI (tr. 8/57-58), the EMI Test Report itself explained that "[t]hese changes were made to correct system performance problems unrelated to EMI" (GSR4, tab 1284 at Sheet 11). There is no evidence that the Government directed these design changes.

1-31. At about this time, NavCom discovered that it had used a Hewlett Packard spectrum analyzer and software package that contained a programming error. This caused up to 15dB measurement error in RE02. NavCom asked to retest CE01, CE03, RE01 and RE02, and update the January 1992 test data. During retesting which occurred between 25 and 27 February 1992, RE01 testing was halted because of out-of-tolerance magnetic leakage caused by a fabrication problem in the RTS display unit power supply. NavCom

ultimately passed the RE01 test on 20 March 1992 after its vendor corrected the RTS display power supply problem. (GSR4, tab 1284 at Sheet 11)

1-32. NavCom seeks $1,335,209 for Claim No. 1 relating to EMI testing (Claim at 161). According to NavCom, it is claiming for "writing the tests, the extra tests, for handling the comments, for incorporating the test procedures, for running the the tests, and then for redesigning the equipment because we had trouble with these tests" (tr. 8/30).

DECISION

EMI TESTS (Claim No. 1)

EMI testing of first articles was required by ¶ 4.3, "First article inspection," and Table III of MIL-T-24664(EC) of the 155 Contract. NavCom does not challenge that the RTS was required to be EMI tested. It contends, however, that there was no requirement to EMI test the ACMs. As to this issue, we have concluded elsewhere in this decision that the RTS and the seven ACMs constituted the "First Article Unit" as defined in Item 0001, Section C, of the contract schedule. That being the case, we conclude that the ACMs and the RTS were both required to be EMI tested.

Since the ACMs were required to be EMI tested, it follows that the EMI Control Plan required by CDRL Item No. L001 and the EMI Test Plan required by CDRL Item No. L002 were required to include testing provisions for the ACMs. Although the Government initially approved NavCom's EMI Compatibility Control Plan and EMI Test Plan, we have found that the approving authority failed to notice that NavCom's EMI Compatibility Control Plan did not address the ACMs, and that the approving authority was not aware of the dispute between the parties when he approved the EMI Test Plan. In this regard, submittal approval generally will not result in a waiver of contract provisions unless there is an express request for waiver by the contractor. *See A&A Insulation Contractors, Inc.*, VABCA No. 2766, 92-2 BCA ¶ 24,829 (Government's approval of a submittal does not relieve the contractor of contractual duties).

NavCom contends that the Government expanded on the EMI testing required by the 149 Contract. The short answer to this contention is that the EMI testing requirement for the 155 Contract was different. In the 149 Contract, the Government specified six EMI tests for R&D purposes. In the 155 Contract, the Government eliminated the reference to the six EMI tests. We have found that by eliminating the six specific tests and referencing broadly MIL-T-28800, the Government invoked in the 155 Contract the full range of EMI testing required by that specification.

There is no substance to the allegation that the Government expanded the scope of EMI testing by demanding multiple revisions of the EMI Test Plan. The evidence shows that NavCom's initial test plan failed to include the ACMs in the test plan drawing and the

table listing the EUT to be tested (Revision A) and failed to show how the ACM would be hooked up to the unit tested (Revision B). The evidence also shows that the Government merely required NavCom to comply with the requirements of MIL-STD-461 and MIL-STD-462, both of which were invoked by ¶ 4.5.6.5 of MIL-T-28800.

There is also no evidence that the Government directed NavCom to conduct a dry run of the EMI test. The EMI test NavCom alleges to have been the dry run was described in NavCom's own documents as "[a] complete EMI test [that] was run successfully." The record does not show that NavCom ran another complete EMI test to satisfy the contract requirement.

Subsequent to the successful EMI testing in January 1992, NavCom made minor design changes to the ACM filter pin connector in the RTS front panel, and to the grounding and bonding of the ACM. There is no evidence that the Government directed these design changes. To recover under a constructive change theory, a contractor has the burden of showing that the work performed was not "volunteered," but was performed pursuant to Government direction. *See Len Company and Associates v. United States*, 385 F.2d 438, 443 (Ct. Cl. 1967); *S-TRON*, ASBCA Nos. 45893, 46466, 96-2 BCA ¶ 28,319 at 141,397. NavCom has failed to carry this burden.

CONCLUSION

Because the ACMs were required to be EMI tested, we hold that NavCom is not entitled to an equitable adjustment for being required to revise its EMI Test Plan to include the test provisions for the ACMs, and because the Government merely required NavCom to comply with the specification requirements, we hold that NavCom is not entitled to an equitable adjustment for being required to revise its EMI Test Plan until it was satisfactory.

Because the Government inadvertently approved the EMI Test Plan, we hold that it did not waive the contract requirement for EMI testing.

Because the Government did not direct NavCom to make the minor design changes to the ACM filter pin connector and to the grounding and bonding of the ACM, we hold that NavCom performed the work as a volunteer and is not entitled to an equitable adjustment.

Accordingly, NavCom's appeal in connection with Claim No. 1 is denied.

ASBCA No. 52293 - Claim No. 3

ACM DROP TEST

FINDINGS OF FACT

3-1. Among the first article environmental testing required was the "high impact shock" test. This test was required by ¶ 3.3.4, "Shock," and required to be performed in accordance with ¶ 4.5.5, "Environmental tests":

> 3.3.4 Shock. The equipment shall conform to the high impact shock requirement of MIL-S-901, Grade A, principal unit, Type A. The mounting may be either Class I or Class II; however, the oscilloscope shall be installed in the equipment for either testing. The Class II mounting, if used, shall be subject to the approval of the procuring activity.

(R4, tab 26 at 002206)

> 4.5.5 Environmental tests. The equipment shall be subjected to the tests specified in a through d for Class 3 equipment in accordance with the examination and test methods specified in MIL-T-28800:
>
> a. Temperature and humidity test
> b. Altitude test
> c. High impact shock test
> d. Vibration test

(R4, tab 26 at 002238)

3-2. MIL-S-901C covers the shock testing requirements for:

> [S]hipboard machinery, equipment and systems which are required to resist High Impact (HI) mechanical shock. The requirements are for the purpose of determining the suitability of machinery, equipment and systems for use under the effects of the severe shock which may be incurred in wartime service.

(ASR4, tab 559 at 1339) This specification was applicable to both the 149 Contract and the 155 Contract (tr. 7/122).

3-3. MIL-S-901C defines "Grade A" at ¶ 3.1.1.1:

3.1.1.1 Grade A. - Grade A items are machinery, equipment and systems essential for the safety and continued combat capability of the ship. Design shall be suitable to withstand shock loadings [sic] without significant effect on performance (see 6.1) and without any portion of the equipment coming adrift or otherwise creating a hazard to personnel or vital systems (see 3.2).

(ASR4, tab 559 at 1341)

3-4. MIL-S-901C defines "Principal units" and "Subsidiary component" as follows:

3.1.2.4 Principal units. - Principal units are items of equipment or assemblies of equipments [sic] which are the major parts of a system such as diesel-generator sets,[ ]air conditioning plants, switchboards, radio transmitters, steam generators, missile launchers or large valves directly supported by ships structure.

3.1.2.5 Subsidiary component. - Subsidiary components are items of equipment or assemblies of equipments [sic] which form a part of, or are supported on, a principal unit.[ ]These would include such items as the diesel engine of a diesel-generator set, the electric motor of an air conditioning unit, the power supply section of a radio transmitter, a switchboard circuit breaker, items which are attached to the steam generator or a valve supported by the attached piping and similar items.

(ASR4, tab 559 at 1342) There is no dispute that the 155 RTS is a principal unit. Because the ACMs are a part of the 155 RTS, they are more appropriately classified as subsidiary components.

3-5. MIL-S-901 defines Type A and Type B tests:

3.1.5.1 Type A. - Type A test is a test of a principal unit (see 3.1.2.4) . . . .

3.1.5.2 Type B. - Type B test is a test performed on a subsidiary component (see 3.1.2.5) . . . . Inasmuch as a type B test applies to subsidiary components having specific applications, approval will be limited to the specific application.

(ASR4, tab 559 at 1343)

3-6. Paragraph 4.2.2 of MIL-S-901C pertains to "Design of test fixtures":

> 4.2.2.1 Type A. - For type A tests, the principal unit to be tested shall [be mounted] on the shock machine or floating shock platform in a manner simulating the most severe (as regards shock) service condition and method that can be used aboard ship (6.1). . . .
>
> 4.2.2.2 Type B. - For type B tests, the subsidiary components shall be mounted in a manner which is approved by the bureau or agency concerned, as being dynamically equivalent to the mounting provided when they are assembled to form the principal unit. When a specific fixture design is not specified in the individual equipment specification the contractor shall provide a fixture for shock testing the component which will produce the same natural frequencies . . . as those present on the complete and installed principal unit. If alternate methods of attachment to the principal unit are possible then the test fixture shall be designed to simulate the most severe condition.

(ASR4, tab 559 at 1345)

3-7. NavCom prepared a High Impact Shock Test Procedure for the RTS built under the 149 Contract (R4, tab 84 at 005369; tr. 7/119). The 149 RTS underwent a high impact shock test. Since the 149 RTS did not have an external ACM, only the RTS was shock tested. All of the active circuitry which later was housed in the external ACM was shock tested as a part of the 149 RTS. (Tr. 7/120, 8/190)

3-8. The high impact shock test was designed to simulate a torpedo hit or a depth charge (tr. 7/119). In this case, the high impact test required by MIL-S-901C involved mounting the RTS to a metal table. A 400-pound hammer would be raised and dropped from a distance of 1-foot and 3- and 5-feet against the side of the table from each of the 3 axis. (Tr. 8/186-87, 9/168) The test has been described as "extremely severe" (tr. 7/118, 206, 8/188).

3-9. The ACM sits on a work bench. It is not fastened to the work bench or to the frame of the ship. Consequently, the ACM would be able to absorb a lateral blow but would get the full effect of a vertical blow. (Tr. 8/74, 95) Rather than high impact shock, the

ACM would be more susceptible to rough handling or being dropped (ASR4, tab 560 at 003132).

3-10. At the May 1989 PPR meeting, the Government inquired what shock and vibration tests NavCom was to perform on the ACMs. NavCom took the position that the ACMs were not subject to first article environmental testing including the high impact shock tests. The Government took the position that the specification "definitely lumps [ACMs] as 'equipment.' Therefore all tests apply." (Tr. 7/126, 8/72)

3-11. NavCom's 14 November 1989 letter acknowledged that the high impact shock test applied to the 155 RTS and argued that it was inappropriate for the ACMs:

> The [ACM] packaging design is not compatable [sic] with this [high impact shock] test. The [ACM] electronics module was shown in the technical proposal to consist of a circuit card assembly with a structural plastic housing. This design concept is shown in section 5 of the appendix to this report. [NavCom] is willing to consider a shock test that more reasonably conforms to the [ACM] application if one can be identified.

(Ex. G-5004; tr. 8/173)

3-12. We have found that the ACMs which form a part of and are supported on the 155 RTS are more appropriately classified as subsidiary components under MID-S-901C. Under this specification, subsidiary components are subject to Type B tests. Paragraph 4.2.2.2 relating to Type B tests provides that the subsidiary components shall be mounted in a manner approved by the agency concerned. In this case, in lieu of the Grade A, principal unit, Test A test, NavCom proposed a modified drop test that would be performed from a 38-inch standard work-bench as a "suitable compromise." (ASR4, tab 560 at 003132) At a technical review meeting held on 7 February 1990, the Government agreed to substitute the modified drop test for the high impact shock test for the ACMs (ASR4, tab 779; tr. 7/133-35). Other than insisting that NavCom perform all of the contractually prescribed environmental tests, the Government never directed NavCom to do the drop test (tr. 8/195). NavCom came up with the drop test because it believed a drop test was more suitable for the ACMs it designed and because it believed that if the ACMs were a part of the first article, "they shouldn't be completely untested" (tr. 8/93). The modified drop test came about as a result of a "search for the middle ground" and "mutual agreement" between the contractor and the Government (tr. 8/194, 94).

3-13. Thereafter, NavCom wrote several versions of the ACM drop test procedure (tr. 7/138; R4, tab 86). It failed the first ACM drop test. One of the integrated circuits within the ACM broke. To pass the test, NavCom redesigned the ACMs by placing rubber bumpers on the outside of the ACMs. (Tr. 7/139-40, 233)

3-14. NavCom claims $382,657 for developing and conducting the ACM drop test, and for manufacturing the redesigned ACMs (Claim at 196; tr. 7/138, 142).

DECISION

ACM DROP TEST (Claim No. 3)

The high impact shock test was required by ¶ 4.3, "First article inspection," and Table III of MIL-T-24664(EC) of the 155 Contract. Table III requires a high impact shock test (¶ 3.3.4) to be conducted in accordance with ¶ 4.5.5 and MIL-S-901C. NavCom does not challenge that the 155 RTS was required to be subjected to the high impact shock test. It contends, however, that there was no requirement to subject the ACMs to the high impact shock test. As to this issue, we have concluded elsewhere in this decision that the RTS and the seven ACMs constituted the "First Article Unit." That being the case, we conclude that the ACMs could be required to be subjected to the high impact shock test.

The ACMs NavCom designed were housed in a plastic housing. Unlike the RTS, the ACMs sit on a work bench and were not directly supported by the ship's structure. Also unlike the RTS, the ACMs were more susceptible to rough handling and being dropped. NavCom acknowledged that if the ACMs were determined to be a part of the first article, they "shouldn't be completely untested." Under these circumstances, NavCom proposed a modified drop test as a more suitable test to be substituted for the high impact shock test, and the Government agreed to the proposal.

We have found that the Government did not direct NavCom to institute the drop test. We have found what NavCom ultimately proposed and performed was a Type B test, treating the ACMs more appropriately as a subsidiary component under MIL-S-901C, and the Government accepted the alternate test NavCom proposed.

CONCLUSION

Because NavCom was required by contract to perform a high impact shock test on both the RTS and the ACMs, and because the modified drop test NavCom proposed that it would perform instead satisfied the requirement for Type B tests for a subsidiary component under MIL-S-901, we hold that NavCom is not entitled to an equitable adjustment for developing and conducting the ACM drop test.

Accordingly, NavCom's appeal in connection with Claim No. 3 is denied.

ASBCA No. 52293 - Claim No. 7

ACM BIT

FINDINGS OF FACT

7-1. Built-in-test or BIT is used to find or isolate faults in the equipment being tested (tr. 7/172). Paragraph 6.4.4 of MIL-T-24664(EC) defines "BIT" as:

> Test devices which are an integral part of the equipment being tested. BIT may be automatic, manual, on-line, off-line, or a combination thereof.

(R4, tab 15 at 001014)

Maintainability and Maintainability Demonstration

7-2. The concept of maintainability relates to the equipment operator's ability to determine that the equipment has failed, troubleshoot the equipment, identify what is wrong with the equipment, and fix it (tr. 8/201). Maintenance of equipment is accomplished at three levels. The "depot" level "has lots of test equipment;" it "takes in the bad assemblies and replaces . . . whatever is wrong . . . tests it thoroughly . . . and then sends it back." The "intermediate" level "can replace some of the assemblies, but [it] usually [does not] replace the individual parts." The "organizational" level is where the users are located. At this level, there is little or no maintenance equipment. (Tr. 7/150) By selecting the organizational level of maintenance for the 155 Contract, the Government required maintainability of the RTS equipment at a level where little or no test equipment was available (tr. 7/151).

7-3. Maintainability of a piece of equipment is measured in Mean-Time-To-Repair (MTTR) and Maximum-Time-To-Repair (Mmaxct) (tr. 9/7-8). The 155 Contract required NavCom to perform a maintainability demonstration. NavCom was required to demonstrate a MTTR number as to "how long . . . it take[s] to find out that the unit isn't working right and to fix it" (tr. 7/149-50).

7-4. Paragraph 3.13 of MIL-T-24664(EC) pertains to "Maintainability":

> 3.13 Maintainability. Maintainability shall be as specified in 3.13.1 through 3.13.3.
>
> 3.13.1 Quantitative corrective maintenance. The equipment, including built-in test (BIT) (see 6.4.4) and the oscilloscope (see 3.6.18) shall have a mean-time-to-repair (MTTR) not

> exceeding 0.75 hour and a maximum-corrective-maintenance-time (Mmaxct) (95th percentile) not exceeding 2.0 hours, when corrective maintenance is accomplished at the organizational level of maintenance . . . .

Paragraph 3.13.2.2.1, "BIT capability," provides:

> The equipment shall contain a BIT facility. Upon initial turn-on and every time the reset key is depressed, the equipment shall run through a test which, as a minimum, shall test for an output from each output jack. . . . Upon any failure, a unique code with the legend SELF TEST FAILED shall be displayed, which shall be cross referenced to a table of errors. If no errors occur, the unit shall flash SELF TEST OK before proceeding to the first frame. BIT shall not require any operator intervention or cable hook up. BIT shall not require more than 5 seconds to be performed.

(R4, tab 15 at 001004-1005) We find what is described in this paragraph is essentially what is set forth in ¶ 6.4.4 as "automatic" BIT.

7-5. Because the Government believed that requiring automatic BIT would add circuitry in the ACMs and reduce reliability of the 155 RTS equipment, it decided to exempt the ACMs from the requirement of ¶ 3.13.2.2.1 (tr. 8/199-200, 213). Attachment Two, "Changes to MIL-T-24664(EC)," issued with the RFP, amended ¶ 3.13.2.2.1 as follows:

> 3.13.2.2.1 Add a sentence to the end of the paragraph reading as follows. "The oscilloscope and the [ACMs] shall be exempt from the BIT requirements."

(R4, tab 15 at 001040; 7/165-71, 246-47)

7-6. Paragraph 4.7 of MIL-T-24664(EC) pertains to maintainability demonstration. It provides:

> 4.7 Maintainability demonstration. A maintainability demonstration shall be performed as specified in 4.7.1 through 4.7.8.
>
> 4.7.1 Maintainability equipment demonstration. The contractor shall perform a maintainability and BIT or diagnostic

> demonstration at the organizational level. The demonstration shall be performed by a Navy civilian or military technician and shall be used to verify conformance to the equipment corrective maintenance (Mct and BIT or diagnostics) requirements. This demonstration may be at the contractor's facilities or at a Government site.
>
> . . . .
>
> 4.7.2.2 BIT or diagnostics. At the insertion of each simulated fault or malfunction, the BIT or diagnostics shall be exercised and compliance or noncompliance with the requirements for fault detection and isolation shall be determined. The accept criteria for fault detection and isolation shall be not less than:
>
> a. 48 out of 50 of the failures are detected

(R4, tab 15 at 001011-001012)

7-7. Thus, during maintainability demonstration, NavCom had to prove that its RTS equipment could be maintained within the time limits specified (*i.e*., 0.75 hour, MTTR and 2 hours Mmaxct) pursuant to ¶ 3.13.1, and that the equipment was able to detect a minimum number of faults (*i.e*., 48 out of 50) pursuant to ¶ 4.7.2.2.

Events Leading To The Dispute

7-8. At the time it prepared its proposal, NavCom understood that maintainability demonstration was to be accomplished using strictly BIT. "That's the way it was conducted on the 149 [Contract], and that's the way it was understood and proposed to be conducted on the 155 [Contract]." (Tr. 7/153) At the time it prepared its proposal, NavCom understood that the ACMs were exempt from BIT (tr. 7/166, 171, 247). It concluded that "when the Government removed BIT from the ACMs . . . they also removed the ACMs from any maintainability demonstration" (tr. 7/174).

7-9. The Government and NavCom got into a "nasty little debate" during a critical program review meeting held in March 1990. At this meeting, NavCom took the position that "we don't have BIT in ACMs and they're not subject to maintainability demonstration because they don't have BIT." (Tr. 7/183) NavCom maintained that even if it performed the maintainability demonstration on the ACM, it would not know whether the UUT or the ACM was bad because the ACM had no self-testing capability without BIT (R4, tab 167 at 006780; tr. 8/217-18).

7-10. At this point in 1990, NavCom had already designed the ACMs and BIT was not designed into the ACM. The ACMs had been built and were undergoing testing and programming. (Tr. 7/183-84) A 4 April 1990 NavCom memorandum summarized the problem, and NavCom's proposed solution:

> The AN/UPM-155 interfaces to a particular Unit Under Test (UUT) through an electronic cable assembly called an Analog Control [sic] Multiplexer (ACM). The RTS performs a self test during power up or when commanded by an operator. By specification ACMs are excluded from this test. Operationally it would be desireable[sic] to have a means of verifying ACM performance to improve confidence in UUT testing results and for ACM maintenance checks. It is conceivable that a common situation could occur where an operator would like to verify if an observed UUT automatic test failure resulted from a failed UUT or a failed ACM. This capability can only be achieved by ACM or UUT substitution now.
>
> This report provides a brief technical description of a proposed manual ACM performance test capability that can be added to the AN/UPM-155. . . . The addition of this capability is considered to be out of scope to the existing contract.

(R4, tab 168 at 006782)

7-11. NavCom submitted its maintainability demonstration plan on 2 April 1990 (R4, tab 170). With respect to the items subject to demonstration, NavCom did not mention the ACMs (tr. 7/186). The Government reviewed NavCom's plan and by letter dated 29 June 1990 withheld approval "pending satisfactory revision of the Maintainability Demonstration Plan" (R4, tab 171). Paragraph 3 of the Government's comments stated:

> 3. The Display Module and the Analog Controller-Multiplexers are not addressed. Provide an analysis of both assemblies within this document.

(R4, tab 171 at 006842)

7-12. At a technical status update meeting held on 13 September 1990, NavCom provided the Government several options to satisfy the requirements of the maintainability demonstration requirement for the ACMs (tr. 8/221). The options ranged from incorporating full BIT capability to a semi-automatic approach (tr. 8/221-22). Consistent with its objective of keeping the ACMs simple, the Government indicated that it preferred the semi-automatic approach (tr. 8/222). This approach required the use of a technical

manual (subject of Claim No. 10). It also required the operator to use a volt meter to test each pin of the ACM. (Tr. 8/222-23) This approach took approximately 30 minutes to run, and was what NavCom ultimately delivered and referred to in its claim as the "ACM BIT" (tr. 7/250-52, 8/222).

7-13. Although the semi-automatic approach for demonstrating ACM maintainability used "some firmware assisted guided probe maintenance technique" (tr. 9/51), it did not meet the requirement of ¶ 3.13.2.2.1, "BIT capability," from which NavCom was exempt. The semi-automatic approach required about 30 minutes as opposed to 5 seconds to run. In addition, the approach required operator intervention. (Tr. 8/225-26) NavCom acknowledged that what it came up with "wasn't really 100 percent BIT" (tr. 7/190-91). We find this semi-automatic approach to be either a manual BIT or diagnostics for fault detect.

7-14. To enable the ACMs to demonstrate maintainability, NavCom had to make hardware as well as software design changes. The hardware changes involved adding wires and cables to run signals from the RTS to the ACM. Software changes had to be made in each of the seven ACMs. In addition, NavCom had to change the software in the RTS to come up with a routine to run the demonstration. (Tr. 7/190-91) With these changes, NavCom successfully completed its maintainability demonstration between 17-21 June 1991 (R4, tab 160). NavCom claims $187,302 for this work (Claim at 375).

DECISION

ACM BIT (Claim No.7)

NavCom claims $187,302 for having been required to make hardware and software changes to the 155 RTS and ACMs to pass the maintainability demonstration required by the specification (¶ 3.13.1 (0.75 hour MTTR/2 hours Mmaxct) and ¶ 4.7.2.2 (detect 48/50 failures)). NavCom contends that since the ACMs were exempt from BIT, the ACMs were also exempt from the maintainability demonstration. The Government contends that although the ACMs were exempt from the specific requirements of ¶ 3.13.2.2.1 relating to "BIT capability," -- "BIT shall not require any operator intervention or cable hook up. B[IT] shall not require more than 5 seconds to be performed" -- NavCom was free to use less demanding BIT or other diagnostics in the ACMs to satisfy the maintainability requirements of the contract.

It is well established that provisions of a contract must be considered as a whole and interpreted so as to harmonize and give meaning to all of its provisions. Thus, "an interpretation which gives a reasonable meaning to all parts will be preferred to one which leaves a portion of it useless, inexplicable, inoperative, void, insignificant, meaningless, superfluous, or achieves a weird and whimsical result." *Julius Goldman's Egg City v.*

United States, 697 F.2d 1051 (Fed. Cir. 1983), *cert. denied,* 464 U.S. 814 (1983), *citing State of Arizona v. United States,* 575 F.2d 855, 863 (Ct. Cl. 1978).

Here, the interpretation that NavCom was exempt only from the specific requirements of ¶ 3.13.2.2.1 relating to operator intervention and self-testing in no more than five seconds, can be harmonized and gives meaning to all parts of the specification. Thus, consistent with ¶ 6.4.4 of MIL-T-24664(EC), NavCom could, if it so chose, furnish a less demanding semi-automatic BIT or some other fault detection diagnostics. Also, consistent with ¶¶ 4.7.1 and 4.7.2.2, NavCom could perform the required maintainability demonstration using "BIT or diagnostics." On the other hand, NavCom's interpretation that the ACMs were exempt from all forms of BIT cannot be harmonized with the maintainability demonstration provisions of the specification which continued to refer to the use of "BIT or diagnostics." NavCom's interpretation would render such references meaningless and superfluous.

The 155 RTS interfaces with the UUT through the ACM. Thus, even though separate, the RTS and the ACM work together and function as a unit. As NavCom itself observed, the RTS performs a self test during power up or when commanded by an operator. If the ACM was exempt from the maintainability and the maintainability demonstration requirements of the specification, it would mean that the ACM half of the RTS equipment would not be tested for its ability to accurately detect faults and to detect them within the time constraints required by the specification. This is a "weird" result that would render the entire maintainability requirement of the contract pointless. Accordingly, we conclude that NavCom's conclusion that the ACM was exempt from maintainability demonstration is untenable.

To demonstrate the fault detection aspect of ACM maintainability, NavCom came up with what it called a semi-automatic approach which required operator intervention and approximately 30 minutes to run. The Government accepted this approach. We have found that this approach to be either a semi-automatic BIT or diagnostics for fault detection.

CONCLUSION

Because the ACMs were not exempt from the fault detection and maintenance time (maintainability) requirements of the contract, and because NavCom furnished no more than what the contract called for through a semi-automatic approach short of automatic BIT from which it was exempt, we hold that NavCom is not entitled to an equitable adjustment for Claim No. 7.

Accordingly, NavCom's appeal in connection with Claim No. 7 is denied.

ASBCA No. 52294 - Claim No. 4

MEASUREMENT MODULE (PULSED FREQUENCY ACCURACY)

FINDINGS OF FACT

4-1. This claim involves the measurement module of the 155 RTS. The Government contends that the contract required the RTS to accurately measure pulsed frequency over a range from 12 to 1200 MHz at a temperature range of 0° to 55° C. NavCom contends that it should only be required to meet the accuracy requirement at a reasonable number of calibrated frequency points within the 12 to 1200 MHz range at ambient temperature. Because NavCom contends that the Government changed its interpretation of the same specification used in the 149 Contract, a review of the facts surrounding the R&D contract is necessary.

The 149 Contract Specification

4-2. RF are generated by an oscillator. When transmitted in space, they are referred to as RF signals (tr. 1/165). From the beginning, the IFF Program has been assigned frequency bands of 1030 MHz and 1090 MHz. (Tr. 2/16-17) The 149 Contract required NavCom to demonstrate that its R&D units could accurately measure frequencies over a range from 12 to 1200 MHz (tr. 1/183-84). In addition, the specification required NavCom's R&D units to be able to be calibrated in less than an hour, and to hold the calibration for one year (tr. 2/189, 193, 207).

4-3. The applicable specification for the 149 Contract was ELEX-T-457A. Paragraph 3.7.17 of that specification relating to the "Measurement section" of the R&D test set contained an "accuracy" provision and a "counter" provision:

> 3.7.17.5 HF. When the KM function selector switch is in the HF position, the frequency of external pulsed and CW signals applied to RF I/O shall be measured. The accuracy shall be ±1 least significant bit or ± 0.02 percent, whichever is greater.
>
> 3.7.17.5.1 Counter. The counter shall measure the frequency . . . for pulsed signals from 10 W to 10 kilowatts (kW). . . . The range of the signals measured shall be from 12 MHz to 1.2 gigahertz (GHz).

(R4, tab 2 at 000145; tr. 11/173)

4-4. The temperature and humidity range over which the 149 RTS was required to operate is set forth in:

> 3.3.1 Temperature and humidity. Except as otherwise specified herein, the equipment shall conform to the temperature requirements of MIL-T-28800:
>
> a. Operating: 0° Celsius (C) to 55° C.

(R4, tab 2 at 000126)

4-5. ELEX-T-457A contained the following requirement with respect to calibration:

> 3.4.2.3 Calibration. The equipment calibration interval shall be one year or longer. The equipment shall be capable of being calibrated in one hour or less with a design goal of 30 minutes or less.

(R4, tab 2 at 000129; tr. 10/20)

4-6. Calibration is the periodic alignment of instruments to ensure accuracy (tr. 11/193). It is a process whereby measurements are compared with known standards, and "fudge factors" are used to correct inaccurate measurements to conform to the known standards (tr. 10/99, 11/16-17). Calibration, however, can only correct repeatable errors (tr. 10/123, 11/126). "Systematic" or "built-in" errors can be corrected by calibration. (Tr. 10/101, 123) Calibration cannot correct errors which are temperature dependent (tr. 11/139). Generally, RTS functions such as pulsed frequency, pulsed power, pulsed width and a variety of other parameters can be calibrated (tr. 10/97-98). The use of calibration as an error correction method was limited in this case by how much calibration can be done within an hour. The one-hour calibration limitation applied to all parameters of the test set, not only to pulsed frequencies (tr. 12/58).

4-7. There are infinite calibration points between 12 to 1200 MHz (tr. 10/186-87). Some 500 calibrations would be necessary to cover the entire 12 to 1200 MHz range (tr. 10/118). A Government witness acknowledged that it would have been impossible to calibrate the pulsed frequency of the entire 12 to 1200 MHz range and other parameters within the one-hour limitation (tr. 10/185). On the 149 EDM, NavCom was only able to calibrate 44 combined power and frequency points within an hour (tr. 12/43).

4-8. Under the 149 Contract, NavCom was required to develop a test procedure for the EDMs (tr. 11/179). NavCom submitted a Level A test procedure to the Government for approval on 29 November 1984. The Government's comments showed that it did not consider NavCom's power and frequency measurements to have been sufficiently

comprehensive. The Government identified six specific frequencies which "should be included in the procedure." (ASR4, tab 571 at 035872; tr. 10/166-67) The parties subsequently agreed to test only the six frequencies for accuracy (tr. 10/118-20).

4-9. The pulsed frequencies selected for accuracy testing were 12, 300, 960, 1030, 1090, and 1200 MHz. The 12 and 1200 MHz were selected because they represented the low and high ends of the frequency range specified in ELEX-T-457A. The 1030 and 1090 MHz were selected because they were the only operating frequencies in use by the IFF interrogators and transponders at that time. The 300 and 960 MHz were selected because they represented "in between" frequencies. (Tr. 10/20, 81-83) NavCom initially calibrated its R&D test sets manually; it took 16 hours or overnight (tr. 2/180, 188). Towards the end of testing, NavCom switched from manual calibration to automated calibration (Autocal) using an external computer (tr. 2/188). During maintainability demonstration on EDM II, NavCom told the Government that it had solved the one-hour calibration problem, and that it was able to calibrate the test set in less than an hour (tr. 1/206, 2/189-93; ASR4, tab 577).

4-10. At the time of the R&D and the production contracts, transponders and interrogators operated only at 1030 and 1090 MHz (tr. 1/185). These frequencies are used not only in the United States but all over the world (tr. 2/58). To go to a new IFF frequency would be a "massive" undertaking (tr. 2/59). Although it is possible to calibrate any specific point between 12 and 1200 MHz, NavCom takes the position that the test sets only need to operate at 1030 and 1090 MHz (tr. 1/186, 2/56-57). The Government acknowledges that no new frequencies have been introduced in the last 40 years. It points out that investigations on using other frequencies are ongoing, and since the normal life span of a test set is approximately 20 years, extending frequency bands to cover future requirements was necessary (tr. 2/56, 4/279).

4-11. NavCom used a dual counter technique to measure frequency accuracy on the 149 EDMs (tr. 10/23, 130). The measurement module employed the Fairchild 100 K ECL (Emitter Coupler Logic) device which in and of itself was not fast enough to correct errors within an hour (tr. 11/25-26, 29). Prior to conducting the accuracy tests, NavCom calibrated the six frequency points (tr. 10/73). When the Government selected the six frequency points for accuracy testing, it did not mean to suggest that the EDMs had to be accurate only at those points (tr. 10/156). Nor were the frequency points intended to constitute the baseline for testing accuracy in any subsequent production RTSs (tr. 10/164-65).

4-12. Late during Level A testing, the Government discovered that NavCom was "only calibrating the points we were testing." Up until then, the Government had been led to believe that "the entire unit was being calibrated." (Tr. 2/179) When the Government questioned NavCom about the lack of accuracy at other frequency points, NavCom responded that it had "only calibrated the points that [the Government was] going to test because they were late and . . . [t]hey were trying desperately to get it through the test

procedure" (tr. 2/180). NavCom represented to the Government during EDM testing that if the test set had a "full calibration," it would be accurate over the entire frequency range (12 to 1200 MHz) called for by the specification (tr. 2/181). NavCom represented that "the box was good over the range, however, they were only calibrating that specific point because that's what we had to test and record for that day" (tr. 2/161).

4-13. After Level A testing, EDM I and EDM II were delivered to the Government. The Government continued to run tests on them. The Government shared the results of its testings with NavCom, either through conversations with NavCom's system engineers, or through actual specification changes. (Tr. 11/183)

The 155 Contract Specification

4-14. MIL-T-24664(EC), the specification for the production contract, made minor changes to ELEX-T-457A. MIL-T-24664(EC) also contained an "accuracy," and a "counter" provision:

> 3.6.16.5 HF. When the KM function selector switch is in the HF position, the frequency of external pulses and CW signals applied to RF I/O jacks shall be measured. The accuracy shall be ±10 Kilohertz (kHz) or ± 0.02 percent, whichever is greater.[8]
>
> 3.6.16.5.1 Counter. . . . The counter shall measure frequencies on the low power input jack from 12 MHz to 1200 MHz. . . .

(R4, tab 27 at 002668)

4-15. The temperature and humidity range over which the 155 RTS was required to operate is set forth in:

> 3.3.1 Temperature and humidity. Except as otherwise specified herein, the equipment shall conform to the temperature and humidity requirements of MIL-T-28800:
>
> a. Operating: -20° Celsius (C) to 55° (the accuracies of this specification do not have to be maintained below 0°C).

(R4, tab 27 at 002651) While the Government changed the low temperature requirement from 0° C to -20° C, it "relieved the contractor of the necessity to maintain the accuracy below zero degrees centigrade" (tr. 11/177).

4-16. Calibration is labor intensive and therefore expensive. Substantial savings could be obtained if accuracy of frequency measurement could be achieved without calibration. When the Government issued its RFP for the 155 Contract for production units, NavCom immediately saw the advantage of redesigning the measurement module to eliminate the need for calibration. An estimate prepared by NavCom's engineers after review of MIL-T-24664(EC) contained the following recommendation:

> 1. EXTENSIVE REDESIGN TO ACCOMPLISH MEASUREMENT WITHOUT CALIBRATION. EXISTING EDM REQUIRES "FUDGE FACTORS" FOR ACCURATE MEASUREMENT, AND DOES NOT ADDRESS TEMPERATURE EFFECTS. THE CURRENT DESIGN USES 100K ECL AND ARE NOT COMPATIBLE WITH THE SYSTEM TEMPERATURE REQUIREMENTS.

(R4, tab 122 at 006269; tr. 10/105, 11/24-25)

4-17. The general calibration requirement of MIL-T-24664(EC) eliminated the 30 minute design goal but otherwise remained the same:

> 3.13.3 Calibration. The equipment calibration interval shall be 1 year or longer. The equipment shall be capable of being calibrated in 1 hour or less.

(R4, tab 27 at 002689; tr. 10/99)

4-18. NavCom's proposal described its calibration procedures:

> Pulsed frequency measurements are calibrated by connecting a frequency synthesizer to the CHAL/TAG input jack and measuring the output of the synthesizer at specified frequency intervals. The differences in known versus measured frequencies are stored in memory to be used to offset the pulse frequency measurement results. The test uses linear interpolation each time a pulsed frequency measurement is requested to determine the correction factor to be used.

(R4, tab 17 at 001425) NavCom contended at the hearing that under its proposal, the Government was to specify the frequencies for accuracy testing so that it could calibrate these points (tr. 10/28). Van Cleave testified that when NavCom prepared its proposal for the production contract, it understood that the requirement for pulsed frequency measurement "was essentially the same as . . . on the UPM-149," and that "[e]ssentially the same [measurement] technique" would be used. He testified that what NavCom proposed

for the 155 Contract was "essentially the same as what we delivered on the 149" and that NavCom "had no reason to believe that what was good for the 149 wouldn't be good for the bid." (Tr. 10/22, 30).

14-19. Notwithstanding NavCom's contentions, however, its proposal did not suggest that the measurement capability of its production units was limited to the specific calibrated frequency points. Its proposal stated:

> 4.6.16 Measurement Section
>
> THE MEASUREMENT SECTION OF THE TEST SET PROVIDES THE BASIC CIRCUITS TO PERFORM THE PULSE WIDTH, PULSE SPACING, FREQUENCY AND POWER LEVEL MEASUREMENTS THUS VERIFYING ALL THE CRITICAL PARAMETERS OF THE UNIT(S) - UNDER - TEST.
>
> . . . .
>
> The measurement capability of the Test Set is designed for an operator to be able to easily make precision measurements on IFF systems. The Test Set has the capability to measure RF power and frequency over a large dynamic (10 mw to 10 kw), and over a large frequency range (12 MHz to 1200 MHz), to a degree of precision found only with the most expensive and sophisticated commercial instruments. . . .

(R4, tab 17 at 001497; tr. 10/91) NavCom's proposal stated elsewhere that accuracy was measured over the 12 to 1200 MHz range:

> 4.6.16.5 HF
>
> THE TEST SET MEASURES CW OR PULSED RF FREQUENCIES FROM 12 MHZ TO 1200 MHZ USING ADVANCED HIGH SPEED SCHOTTKEY LOGIC.

(R4, tab 17 at 001499-1500)

Performance

4-20. John Klein (Klein) was an electronic engineer at NavCom (tr. 11/8). He was not involved with the 149 Contract (tr. 10/36). He became involved with the design of the measurement module of the 155 Contract in late 1988 (tr. 11/11). Klein chose to testify as

a Government witness because "Mr. Van Cleave and I have greatly different interpretations of the specification and I didn't want to be under the pressure to have to testify . . . [to NavCom's] assumption and interpretation of the requirements" (tr. 11/95).

4-21. By June 1988, work was in progress on the measurement section of the RTS. The technical specification was being studied and Klein was preparing to generate a block diagram (depicting the overall design) of the measurement module. (GSR4, tab 1311; tr. 11/42). Klein noted the design deficiencies in the 149 models and began to redesign the measurement module. In October 1988, Klein reported that the 149 model pulsed frequency measurement indicated out-of-specification performance with lower than actual readings. The need for calibration was suspected as the cause (GSR4, tab 1311). By the end of October 1988, it became clear that the measurement module required significant work before it could be produced. (ASR4, tab 564 at 050430-31; tr. 10/113, 11/46) Klein was instructed by his superior to redesign the measurement module (tr. 11/47).

4-22. By November 1988, three months prior to award of the 155 Contract, NavCom recognized that "[t]he measurements module is presently the highest cost module in the test set, and a major cost reduction effort is still necessary with this module in order to reduce the overall test set cost" (R4, tab 128 at 006346; tr. 10/109).

4-23. At a meeting held on 21-23 March 1989, NavCom asked what frequencies should be calibrated for testing and whether the Government simply wanted to use the same frequencies used in the 149 Contract. When the Government indicated that it needed a more detailed calibration procedure, NavCom warned that anything more than small changes would affect its design. (R4, tab 131; tr. 10/41-44) During late March and early April 1989, NavCom completely breadboarded and partially tested the pulsed frequency measurement circuitry which represented approximately one-third of the measurement section. (ASR4, tab 746 at 0050420-21; tr. 11/137) Test data showed small cyclic errors (exceeding ± 0.02 percent) which were temperature dependent and could not be corrected by calibration (tr. 11/139).

4-24. The subject of calibration came up again at a preliminary program review meeting held on 22 May 1989. NavCom wanted the Government to designate the specific measurement frequencies. In June 1989, NavCom confirmed that although errors found during testing of the 149 EDMs could be corrected by calibration, calibration would not work when the measurement module had to be tested over the temperature range required by the 155 Contract (ASR4, tab 746 at 050415; tr. 11/141, 143).

4-25. In July 1989, NavCom used a computer to interface with the measurement module breadboard. In order to reduce error, NavCom was exploring the use of Gallium Arsemide (GaAs) circuits:

> If it is essential that the pulsed frequency measurement circuit function totally independent of calibration and still meet the ± 0.02 percent error specification, then GaAs may need to be considered.

(ASR4, tab 746 at 50411-12; tr. 11/145-46, 148) The GaAs integrated circuits were manufactured by the Harris Corporation. This technology had been available since 1985. (Tr. 11/30-31, 74) According to Van Cleave, when NavCom realized what the Government required was the ability to measure frequencies over the 12 to 1200 MHz range rather than at calibrated frequencies, it began to look for a high speed ECL circuitry to replace the one it had been using (tr. 10/117). Klein testified that the decision to look for a high speed ECL was actually driven by NavCom's desire to cut cost. He testified that his primary objective from the beginning was to redesign the measurement module to work without the need to calibrate. (Tr. 11/48, 66, 90-92)

14-26. In early December, 1989, the Government advised NavCom that the ± 0.02 percent accuracy requirement would be applied to "all frequencies, not just the calibrated frequencies" (tr. 10/53). At a meeting held on 23-24 January 1990, NavCom reported that:

> MEASUREMENT MODULE: CURRENT DESIGN DOES NOT MEET ± 0.02% MEASUREMENT ACCURACY FOR PULSE FREQUENCY MEAS. SIX WEEKS OF INVESTIGATION HAS NOT DEFINED A SOLUTION. CURRENT DESIGN REQUIRES EXCESSIVE NUMBER OF CALIBRATION POINTS.

(R4, tab 135 at 006461) The parties had a "confrontation" at the meeting (tr. 10/54). NavCom asserted that it was "very very far along," and it was ready to "stop designing and start building." (Tr. 10/52-53) NavCom took the position that the Government's new interpretation would require redesign, and that it would submit a request for equitable adjustment (tr. 10/51-52, 54). Notwithstanding Van Cleave's assertion to the contrary, Klein testified that the Government's interpretation of the measurement requirement under the 155 Contract never changed. He testified that his goal from the beginning was to design the measurement module "to be absolutely accurate without calibration over the 12 to 1,200 megahertz frequency range." (Tr. 11/66)

4-27. In January 1990, Klein found a very high speed ECL manufactured by the Sony Corporation (Sony). This device would solve NavCom's one-hour calibration problem "in the sense that measurements could be made so accurately . . . calibration was not required" (tr. 11/73). Klein recommended that NavCom seek the Government's approval to use the device (GSR4, tab 1311; tr. 11/70). The Sony ECL became available in late 1989. It was not available at the time NavCom bid the 155 Contract. (Tr. 10/75) According to Klein, had the Sony ECL not been available, he would have recommended GaAs. The GaAs device

use a different set of integrated circuits. It would work even better because it worked at 2000 MHz clock frequencies as opposed to the Sony ECL which worked at 1600 MHz clock frequencies. (Tr. 11/30-31)

4-28. Klein's 21 January 1990 Weekly Highlights reported that the Sony ECL had been ordered and delivery was expected in 12 weeks. The Sony ECL still had not been approved by the Government and Klein recommended that NavCom "resolve this issue prior to developing production hardware that will use them." (GSR4, tab 1311; tr. 11/72-73) The Government ultimately approved the Sony ECL (tr. 10/127).

4-29. On 19 April 1990, the Government provided NavCom the following comments on the first article test procedures with respect to RF power and frequency measurements:

> Nav Com [sic] should word the procedures to cover all limit conditions of power, frequency and pulse widths specified in MIL-T-24664 and arrange for 6-8 test values in between each set of limits, to be selected at random by navy witnesses at test time. These will be pre-selected and will not delay testing.

(R4, tab 35 at 003457) NavCom regarded this comment as "confirmation that we were to change the test procedures to test these points at random in between frequencies" (tr. 10/61).

4-30. The foregoing comment was "absolutely devastating" to NavCom. NavCom had based the production RTS design on "fixed frequencies, fixed tests." Consequently, the test procedures it proposed was "very, very similar to the test procedures that were negotiated and settled by Mr. Rand on the 149 program and approved by the government." It became clear to NavCom that its design "could not meet the accuracy requirements in between [the] calibrated points." (Tr. 3/242-43). While NavCom and the Government agreed upon the specific frequency points to be tested and NavCom calibrated those points for purposes of testing the R&D units, we are unable to find that the parties agreed that those were the only points where frequencies had to be accurate. Requiring frequency accuracy at random points would require NavCom to either "calibrate at every frequency in the entire spectrum" or "change the design radically to where little or no calibration was required" (tr. 4/61).

4-31. To accommodate the Sony ECL, NavCom had to redesign the line receivers and integrated circuits of the 149 measurement module (tr. 10/63-66, 68). The redesign resulted in "100 to 1 overall improvement over the EDM." NavCom's redesign eliminated the need to "calibrate . . . at all at any frequency." (Tr. 10/68-69) NavCom contends there was a second redesign of the measurement module in June 1990. We find there was no second redesign. NavCom simply corrected some of its own mistakes and put higher speed

components into the module so that it "function[ed] better relative to pulsed RF frequency measurement" (tr. 11/84, 94).

4-32. NavCom's May 1995 claim sought $1,699,917 for designing and producing the first article measurement module of the 155 RTSs (Claim at 256).

DECISION

PULSED FREQUENCY MEASUREMENT ACCURACY (Claim No. 4)

At the time of the 149 and 155 Contracts, transponders and interrogators operated only at 1030 and 1090 MHz. NavCom contends it was therefore not necessary for pulsed frequencies to be accurately measured over the 12 to 1200 MHz range. The Government acknowledges that no new frequencies had been introduced in the last 40 years. It counters that investigations on using other frequencies are ongoing, and since the normal life span of a test set is approximately 20 years, extending frequency bands to cover potential future requirements is necessary. NavCom also argues that the Government did not need an RTS that worked over the full temperature range of -20° to 55° C (frequency accuracy on the 155 RTSs only had to be maintained above 0° C).

With regard to these arguments, it is well-settled that the Government is entitled to receive what its contract demands. *Jack Stone Co. v. United States,* 170 Ct. Cl. 281, 290, 344 F.2d 370, 376 (1965); *Rixon Electronics, Inc. v. United States,* 210 Ct. Cl. 309, 320, 536 F.2d 1345, 1351 (1976) (the Government could, if it wanted, "engage a contractor to make snowmen in August"); *Maxwell Dynamometer Co. v. United States,* 181 Ct. Cl. 607, 628, 386 F.2d 855, 868 (1967) ("regardless of the technical soundness of the Government's requirements, a contractor must comply with them and cannot substitute its own views for those of the Government").

With respect to what pulsed frequencies should be measured for accuracy, NavCom does not contend that the specifications were unclear or in any way ambiguous. The 149 specification required pulsed frequencies to be measured from "12 MHz to 1.2 gigahertz (GHz)." The production contract likewise required pulsed frequencies to be measured "from 12 MHz to 1200 MHz." NavCom clearly understood what the 155 Contract required. The measurement section of its technical proposal stated that "[t]he Test Set has the capability to measure RF . . . frequency . . . over a large frequency range (12 MHz to 1200 MHz)." Elsewhere in its proposal, NavCom stated that the test set it proposed "MEASURES FREQUENCIES FROM 12 MHZ TO 1200 MHZ."

NavCom contends that since it was impossible to calibrate the entire range of frequencies, from 12 to 1200 MHz, within an hour, the specification should be interpreted to require accuracy measurement at only a reasonable number of calibrated frequency points. This issue requires a determination of whether the specification in question is a

design or performance specification. Performance specifications simply set forth an objective or end result to be achieved, and the contractor may select the means of accomplishing the task. *Big Chief Drilling Co. v. United States*, 26 Cl. Ct. 1276, 1294 (1992). Design specifications, on the other hand, set forth in detail the materials to be employed and the manner in which the work is to be performed. *J.L. Simmons Co. v. United States*, 412 F.2d 1360, 1362 (Ct. Cl. 1969). Since the production contract specification only required NavCom to attain the required accuracy (± 10kHz or ± 0.02 percent, whichever is greater) over the 12 to 1200 MHz range, and did not specify the means for meeting the requirement, we conclude that the specification was of a performance variety, and NavCom was not bound to attain measurement accuracy by calibration. The evidence shows that NavCom ultimately used a Sony ECL device which enabled its measurement module to accurately measure pulsed frequencies over the 12 to 1200 MHz range without calibration. Although this device was not available until late 1989, we have found that had NavCom employed the GaAs device which had been available since 1985, the 155 measurement module would have been able to accurately measure pulsed frequency over the 12 to 1200 MHz range without calibration.

NavCom contends that it was entitled to conduct accuracy measurements of pulsed frequencies under the 155 Contract in the same way it conducted the measurements under the 149 Contract. It contends that since the requirements of the two contracts were the same, the Government constructively changed the 155 Contract when it interpreted its measurement requirements differently. We understand NavCom to be arguing that it relied on a prior course of dealing between the parties to its detriment.

"A course of dealing is a sequence of previous conduct between the parties to an agreement which is fairly to be regarded as establishing a common basis of understanding for interpreting their expressions and other conduct." RESTATEMENT (SECOND) OF CONTRACTS § 223(1) (1981). Section 1-205(1) of the Uniform Commercial Code (U.C.C.) defines "a course of dealing" as:

> a sequence of previous conduct between the parties to a particular transaction which is fairly to be regarded as establishing a common basis of understanding for interpreting their expressions and other conduct.

The courts have held that a single transaction cannot constitute a "course of deailing" within the meaning of U.C.C. § 1-205(1). *See International Therapeutics, Inc. v. McGraw-Edison Co.*, 712 F.2d 488 (5th Cir. 1983); *Product Components, Inc. v. Regency Door and Hardware, Inc.*, 568 F. Supp. 651 (S.D. Ind. 1983). We have said in *Western States Construction Company, Inc.*, ASBCA No. 37611, 92-1 BCA ¶ 24,418 at 121,894:

> . . . While there is no magic number of contracts what must be performed before this principle is applicable, the

> parties' prior dealings must be regular and/or numerous enough to cause a reasonable expectation that the conduct relied upon was not mere accident or mistake, but was the performance actually expected by the other party. . . .

NavCom's argument here is grounded not on a sequence of previous contracts or over an extended period of time, but on a single research and development contract whose purpose was to explore the feasibility of a new generation of RTSs. We have found that NavCom understood that Level A testing was not comprehensive and the Government would conduct further operational testing after the EDMs were delivered. We have also found that those from NavCom involved with the 149 Contract did not expect that the results of Level A testing would establish the testing criteria for subsequent RTS production units. (Finding 20) We conclude that NavCom has failed to establish a course of dealing between the parties which can fairly be regarded as establishing a common basis of understanding for interpreting the specification requirements. *See Longmire Coal Corp.*, ASBCA No. 31569, 86-3 BCA ¶ 19,110, *recon. denied,* 87-1 BCA ¶ 19,454 (a prior course of dealing must relate to a sequence of previous conduct between the parties, not just one prior contract); *Kvaas Construction Co.*, ASBCA No. 45965, 94-1 BCA ¶ 26,513 (Government approval of alternative expansion devices under four prior contracts having substantially the same provisions held insufficient to constitute a course of dealing).

After the 149 EDMs were delivered, the Government, through NRL and NESEA ran tests which were not performed by NavCom. NRL tested the frequency accuracy over the range specified in the 149 Contract and found failure to meet the specification requirements. Tests at NESEA showed there were areas of concern, including accuracy in the measurement of RF. Although the Government intended to share with NavCom its test results, NavCom never received the tests reports because they were never finalized and signed out by the proper authority within the Navy. Failure on the part of the Government to provide its test reports gives rise to NavCom's "superior knowledge" claim. NavCom contends that it is entitled to an equitable adjustment because the Government allegedly had "undisclosed superior knowledge of increased performance requirements identified during the withheld NRL/NESEA tests of the EDM" (Claim at 198).

The elements of proof of a superior knowledge claim are:

> (1) a contractor undertakes to perform without vital knowledge of a fact which affects performance costs or duration, (2) the government was aware the contractor had no knowledge of and had no reason to obtain such information, (3) any contract specification supplied misled the contractor or did not put it on notice to inquire, and (4) the government failed to provide the relevant information.

Hercules, Inc. v. United States, 24 F.3d 188, 196 (Fed. Cir. 1996), *aff'd on other grounds*, 516 U.S. 471 (1996), *citing American Ship Bldg. v. United States*, 654 F.2d 75, 79, 228 Ct. Cl. 220 (1981).

In this case, NavCom had to calibrate the six frequency points to be tested. Therefore, it knew that the frequencies outside the calibrated points could not be accurately measured on its EDMs. Moreover, even though the EDMs were delivered to the Government, NavCom had a breadboard with all of the modules on the EDMs. We have found that NavCom could have ran the same tests NRL and NESEA ran. In addition, even though the NRL/NESEA test results were not given to NavCom, we have found that the Government shared the results of its testing with NavCom, through conversations with NavCom's systems engineers or through meetings when the specification for the production contract was being finalized.

CONCLUSION

Because the Government is entitled to receive what its contract demands, we hold that the Government is entitled to a measurement module which accurately measures pulsed frequency over the entire frequency range (12 to 1200 MHz) that will operate over the entire temperature range (0° to 55° C).

Because the production contract specification only required NavCom to attain the required accuracy and did not specify the means for meeting the requirement, we hold that NavCom was not bound to attain measurement accuracy by calibration.

Because NavCom has failed to establish a course of dealing between the parties, we hold that the Government properly insisted that NavCom's production RTSs meet the specification requirement for pulsed frequency accuracy between 12 and 1200 MHz.

Because the Government possessed no vital knowledge relating to pulsed frequency accuracy that NavCom did not already know, and which NavCom could not itself have obtained, we hold that NavCom has failed to prove that it was misled so as to give rise to a superior knowledge claim.

Accordingly, NavCom's appeal in connection with Claim No. 4 is denied.

ASBCA No. 52295 - Claim No. 5

SCALER/DEMODULATOR MODULE (POWER MEASUREMENT)

FINDINGS OF FACT

5-1. This claim involves the scaler/demodulator module of the 155 RTS. A scaler/demodulator module has two functions: the scaler part of the device reduces the amplitude of the signal by a prescribed amount using an attenuator; the demodulator part of the device detects the amplitude of the signal and measures its power. (Tr. 12/9, 13/12-13) The Government contends that the scaler/demodulator should accurately measure power within the range specified in the specification. NavCom contends that the Government changed its interpretation of the same specification used in the 149 Contract, and that the scaler/demodulator should only be required to accurately measure power at predetermined and calibrated frequency points. (Tr. 12/6-7, 62-63)

The 149 Specification

5-2. The 149 Contract contained the following paragraph with respect to the accuracy of measuring power:

> 3.7.17.6 Power (PWR) position. When the KM function selector switch is in the PWR position, the equipment shall be capable of measuring the peak power of CW or pulsed RF signals applied to the MAIN, AUX, or low power RF IN OUT jack. The signal to be measured shall be selected by the KM demodulator select switch and readout to the display (see 3.7.17.6.1). The range of signals measured shall be as specified in 3.7.17.5.1. The accuracy shall be ± 10 percent.

(R4, tab 2 at 000147)

5-3. Paragraph 3.7.17.5.1 of ELEX-T-457A is the same "counter" provision involved in Claim No. 4. The ranges of power at which frequencies would be measured were set forth as follows:

> 3.7.17.5.1 Counter. The counter shall measure the frequency of CW signals *from* 10 milliwatts (mW) *to* 100 W, and for pulsed signals *from* 10 W *to* 10 kilowatts (kW) . . . . The range of signals measured shall be from 12 MHz to 1.2 gigahertz (GHz).

(Emphasis added) (R4, tab 2 at 000145)

5-4. Under the 149 Contract, NavCom submitted its Level A test procedure for the Government's review on 29 November 1984. The Government's comments, dated 4 February 1985, stated that:

> 51. . . . The power and frequency measurements are not comprehensive enough. The following power and frequency measurement should be included in the procedure. It appears that the power - frequency measurements could be consolidated to eliminate redundant steps.

(ASR4 tab 571 at 035872)

5-5. By agreement, the Government and NavCom subsequently predetermined certain power/frequency combinations for testing. As we noted earlier, six specific CW and pulsed frequencies were selected. The power level at each selected frequency was also predetermined. For example, pulsed frequency of 12 MHz at 25 W was to be tested at the LOW POWER jack; CW frequencies of 1030 and 1090 MHz at 75 W were to be tested at the MAIN and AUX jacks respectively; and pulsed frequency of 1200 at 10 kW was to be tested at the MAIN jack. (ASR4, tab 571 at 035873; tr. 12/46) NavCom calibrated the power levels as well as the frequency points to be tested (tr. 12/23, 43).

5-6. On the 149 EDMs, there was a separate scaler module and a demodulator module (tr. 13/15). The Government's NRL report, dated 10 June 1986, found "about half of the power readings to be out of tolerance" (tr. 12/17). We find that NavCom was capable of reaching the same conclusion through testing on its own breadboard. Since NavCom calibrated the predetermined power levels for Level A testing, we find that it knew power readings, where not calibrated, would not be accurate.

The 155 Specification

5-7. MIL-T-24664(EC), the production contract specification, contained the following paragraph with respect to the accuracy of measuring power:

> 3.6.16.6 Power (PWR) measurement. When the KM function selector switch is in the PWR position, the equipment shall be capable of measuring the peak power of CW or pulsed RF signals applied to the MAIN, AUX, or low power RF IN jack. The signal to be measured shall be selected by the KM demodulator select switch and readout to the display (see 3.6.16.6.1). . . . The range of signals measured shall be as specified in 3.6.16.5.1. The accuracy shall be ± 0.5 decibel (dB).[9]

(R4, tab 27 at 002668)

5-8. The counter paragraph of the production specification (MIL-T-24664(EC)) was revised to require frequency measurement at the following power ranges:

> 3.6.16.5.1 Counter. The counter shall measure frequencies on the MAIN and AUX RF I/O jacks from 960 MHz to 1200 MHz *at power levels from* 25 W or less CW *to* 75 W CW, and *from* 25 W or less pulsed *to* 10 kilowatts (kW) pulsed. The counter shall measure frequencies on the low power input jack from 12 MHz to 1200 MHz *at power levels from* 10 milliwatts (mW) CW and 10 mW pulsed *to* the lower limits of the MAIN and AUX jacks. . . .

(Emphasis added) (R4, tab 27 at 002668)

NavCom's Proposal

5-9. NavCom's 16 February 1988 proposal proposed to combined six modules within the 149 EDM into three. It proposed to combine the 1030 and the 1090 RF generator modules, the MAIN and AUX modulator modules, and the scaler and demodulator modules. (R4, tab 17 at 001415; tr. 12/22, 13/18-19) Combining six modules into three was undertaken for two reasons. One reason was to ease the burden of calibration. By combining modules, a number of cables and connectors could be eliminated and fewer calibration points would be needed for linear interpolation.[10] (R4, tab 23 at 001820; tr. 12/22-23, 136, 13/19) The second reason was to reduce cost (tr. 13/19).

5-10. NavCom proposed to calibrate power at specific frequency intervals:

> Power measurements are calibrated by supplying a known power source to the low power input jack and measuring the power at specified frequency intervals. The differences the known power source and measurement results are stored in memory for each frequency to be used to offset the power measurement results. The Test Set uses linear interpolation each time a power measurement is requested to determine the correction factor for the current operating frequency.

(R4, tab 17 at 001425) Van Cleave testified that this method of measuring power was "Very, very similar to what we talked about on the pulse frequency calibration," and NavCom's intent was to calibrate the 155 production units "the same way we did with the 149 using [its] current [software] programs that ran on a simple IBM PC" (tr. 12/24-25).

Performance of the 155 Contract

5-11. At a program review meeting held on 21-23 March 1989, NavCom inquired at what points it should calibrate for power and frequency measurements. NavCom took the position that "if that changes very much [from the 149 EDMs] it is going to change the design." (Tr. 12/28) At a meeting held on 23-24 January 1990, the Government was told that NavCom was finalizing its design. NavCom again wanted to know at what specific frequencies and power levels accuracy would be tested. The Government's response was 12 to 1200 MHz on the low power jack and anywhere between 960 to 1200 MHz on the MAIN and AUX jacks. (Tr. 12/38-39) Although the parties did not specifically discuss "discrete power levels," NavCom understood the Government's response to imply that it wanted to test the accuracy of "any and all power levels between the low and the high power" (tr. 12/39). Van Cleave testified that NavCom had expected the Government to "reiterate" the specific power levels used in testing the 149 EDMs (tr. 12/40).

5-12. NavCom received the Government's review of its first article test procedure on 19 April 1990. With respect to power measurement, the Government commented "[i]n the RF power . . . measurements, Nav Com [sic] should word the procedure to cover all limit conditions of power . . . specified in MIL-T-24664, and arrange for 6-8 test values in between each set of limits, to be selected at random by navy witnesses at test time. These will be pre-selected and will not delay testing." (R4, tab 35 at 003457). NavCom understood the Government to require accuracy measurement at random power points between the power limits specified. To accommodate this requirement, NavCom alleges that it was forced to redesign the scaler/demodulator module. (Tr. 12/45)

Redesign of the Scaler/Demodulator Module

5-13. The scaler/demodulator module was redesigned three times. The first redesign involved flipping the substrates of the module to maximize shielding. The second redesign involved placing wires in copper tubes, again to increase shielding. The third redesign repackaged the second redesign to reduce costs. (Tr. 12/51-54, 144)

5-14. As applied to RF signals, the term "leakage" refers to a situation when signals leak out when sent "from one place to the other place" (tr. 13/20). Leakage occurs when modules are not properly enclosed or shielded, or when RF "go from one assembly to the other assembly using . . . cables and connectors" (tr. 13/20). "Blowby" refers to a phenomenon where signals leak out at one point in the RF system and reenter the system at some other point (tr. 13/21-22). "Blowby" could "corrupt" the RF signals by changing the amplitude of the signals. This in turn would distort measurement. (Tr. 13/22-23) The industry accepted method of minimizing leakage and "blowby" was to put the subassemblies in shielded submodules (tr. 13/24).

5-15. "Blowby" can be calibrated out at specific frequencies. Because "blowby" is not "constant with frequency," re-calibration would be necessary when a random frequency for testing is selected. Thus, when the Government sought to test frequency at random, NavCom would have to calibrate power at every frequency the Government might pick for testing. (Tr. 12/64-65) When NavCom finally eliminated the need to calibrate pulsed frequencies with the use of the Sony ECL, NavCom was able to calibrate all of the other parameters of the 155 RTS, including power, within an hour as required by the specification (tr. 15/56-58, 60).

5-16. Frank Sulak (Sulak) was a part of the NavCom team that designed the 149 EDMs. He was one of the designers of the scaler/demodulator module under the 155 Contract. Sulak testified that when NavCom decided to combine the modules, it recognized shielding the subassemblies would be necessary to minimize leakage and "blowby" (tr. 13/23-24). He testified he did not initially implement shielding because Van Cleave did not want to "proceed on this complicated package and design approach" (tr. 13/25). To reduce cost, Sulak was forced to design an "open architecture"[11] which did not enclose the subassemblies to provide shielding (tr. 13/25, 34-35, 38-39).

5-17. After it experienced "a great deal of problems due to . . . blow-by," on its first units, NavCom redesigned the scaler/demodulator module. Ultimately, NavCom had to enclose all of the scaler/demodulator subassemblies to pass the first article test. (Tr. 13/25-26) Sulak's Weekly Highlights of 25 May 1990 showed that NavCom's effort "on chasing the blowby have resulted in putting in a lot of shielding into the SCL module" (GSR4, tab 1316 at 021161; tr. 13/60). Sulak testified that the Government did not in any way contribute to the leakage and "blowby" problems and NavCom's redesign efforts resulted from combining the scaler and demodulator modules, and from its own "open architecture" design (tr. 13/60).

5-18. NavCom's claim sought $1,762,778 for redesigning and producing the scaler/demodulator modules for the 155 RTSs (Claim at 318).

DECISION

SCALER/DEMODULATOR MODULE (POWER MEASUREMENT) (Claim No. 5)

Paragraph 3.6.16.5.1 of the 155 Contract required CW and pulsed frequencies from 960 to 1200 MHz to be measured on the MAIN and AUX jacks. For CW frequencies, measurements were required to be made at power levels "from 25 W or less to 75 W." For pulsed frequencies, measurements were required to be made at power levels "from 25 W or less to 10 kilowatts." In addition, ¶ 3.6.16.5.1 required CW and pulsed frequencies from 12 to 1200 MHz to be measured on the low power input jack. For CW frequencies, measurements were required to be made at power levels from 10 mW to the lower limits of

the MAIN and AUX jacks. For pulsed frequencies, measurements were required to be made at power levels from "10 mW to the lower limits of the MAIN and AUX jacks." We conclude there is no ambiguity that accuracy of power measurement was to be measured over the power ranges specified.

Under the 149 Contract, the Government and NavCom predetermined certain power/frequency combinations for Level A testing. NavCom contends that it was entitled to conduct accuracy measurement of power under the 155 Contract in the same way it conducted the measurement under the 149 Contract (tr. 12/129, 130-31). It contends that since the requirements of the two contracts were similar, the Government constructively changed the 155 Contract when it interpreted the power measurement requirement differently.

The specification did not specify how NavCom was to achieve accuracy in power measurement. We conclude that the specification with respect to power measurement was a performance-type specification as opposed to a design type specification. The use of calibration as a method for correcting errors at random points would not have been possible for NavCom to achieve within an hour. However, since NavCom ultimately eliminated the need to calibrate frequencies, calibration of power and other parameters could be accomplished in less than an hour.

As in Claim No. 4, NavCom appears to argue that it relied on a prior course of dealing between the parties to its detriment. As in the case of the measurement module, NavCom's argument is not grounded on a sequence of previous contracts over an extended period of time, but on a single research and development contract whose purpose was to explore the feasibility of a new generation of RTSs. We have found that NavCom understood that Level A testing was not comprehensive and the Government would conduct further operational testing after the EDMs were delivered. We have also found that those from NavCom involved with the 149 Contract did not expect that the results of Level A testing would establish the testing criteria for subsequent RTS production units. (Finding 20) We conclude that NavCom has failed to establish a course of dealing between the parties which can fairly be regarded as establishing a common basis of understanding for interpreting the specification requirements. *See* Cape Romain, 00-1 BCA at 151,643; *Longmire Coal*, 86-3 BCA at 96,603-605; *Kvaas Construction*, 94-1 BCA at 131,973.

NavCom also contends that the Government failed to disclose superior knowledge. What NavCom refers to was the results of NRL testing conducted after the 149 EDMs were delivered to the Government. NRL had conducted power and measurements testing outside the power and frequency points conducted as a part of Level A testing. With respect to power measurements, NRL had found "about half of the power readings to be out of tolerance." We have found that NavCom was capable of reaching the same conclusion through testing on its own breadboard. Moreover, since NavCom had to calibrate the predetermined power levels for Level A testing, we have found that it knew power readings

at levels not calibrated would not be accurate. We conclude, therefore, that the Government possessed no vital knowledge of a fact relating to performance which NavCom did not already know, and which NavCom could not itself have obtained. *See Hercules, Inc.*, 24 F.3d at 196.

NavCom also contends that it was forced to redesign the scaler/demodulator as a result of the Government's requirement to test for power accuracy but at random over the power ranges specified in the contract. Most of the redesign involved providing shielding to minimize frequency leakage and "blowby." NavCom has failed to establish a causal connection between the Government's requirement and its redesign. NavCom's own design engineer testified that the Government did not in any way contribute to the leakage and "blowby" problems. The evidence shows that NavCom's redesign was necessitated by its decision to combine the scaler and demodulator modules, and by its adoption of "open architecture" design, neither of which was directed by the Government. *See Len Company and Associates v. United States,* 385 F.2d 438, 443 (Ct. Cl. 1967) (to recover under a constructive change theory, a contractor has the burden of showing that the work performed was not "volunteered" but was performed pursuant to Government direction).

CONCLUSION

Because NavCom has failed to establish a course of dealing between the parties, we hold that the Government properly insisted that NavCom's production RTSs meet the specification requirement for power accuracy throughout the specified ranges.

Because the Government possessed no vital knowledge relating to power measurement accuracy that NavCom did not already know, and which NavCom could not itself have obtained, we hold that NavCom has failed to prove that it was misled so as to give rise to a superior knowledge claim.

Because redesign of the scaler/demodulator module was necessitated by NavCom's own design deficiencies, we hold that the Government did not constructively change the contract.

Accordingly, NavCom's appeal in connection with Claim No. 5 is denied.

ASBCA No. 52295 - Claim No. 8

CHANNEL TO CHANNEL ISOLATION

FINDINGS OF FACT

8-1. Paragraph 3.6.17 pertains to the "RF section" of MIL-T-24664(EC). Paragraph 3.6.17.2 relates to "RF power outputs." The range of the MAIN and AUX power output is specified as follows:

> 3.6.17.2.1 MAIN RF power OUT. The RF output level at the MAIN RF I/O jack shall be adjustable over the range of 0 dBm [12] to -95 dBm, by the KM attenuator in 1 -dBm increments . . . .
>
> . . . .
>
> 3.6.17.2.2 AUX RF power OUT. The RF output level at the AUX RF I/O jack shall be adjustable over the range of 0 dBm to -95 dBm, by the KM controlled AUX attenuator in 1-dBm increments . . . .

(R4, tab 27 at 002670)

8-2. As explained during the hearing, these paragraphs "defines [sic] that each of the channels has to be capable of driving from zero to minus 95 db and with the associated accuracy of plus or minus 1 db." The accuracy required for various combinations of those attenuator settings on either channel is defined in another paragraph.

8-3. When the Government issued the RFP for the production contract on 2 December 1987, it forwarded to potential offerors MIL-T-24664(EC) as well as Attachment (2), "CHANGES to MIL-T-24664(EC)," dated 10 July 1987 (R4, tab 15 at 001026). Attachment (2) added the following paragraph:

> 3.6.17.2.5 Independent RF output levels. When KM selected for independent RF operation, the specified accuracy tolerance (±1 db) of signal generator power versus attenuator setting for either channel shall be maintained regardless of the modulation or attenuator setting of the other channel.

(R4, tab 15 at 001029)

8-4. What this paragraph required is that, "when you set up an output level on one channel, be it main or aux . . . that whatever you do with the other channel shouldn't affect that channel by more than plus or minus 1 db" (tr. 12/72). In other words, when the attenuator setting of one channel is set to one extreme of its range, *i.e.*, 0 dBm, and the other channel is set to the other extreme of its range, *i.e.*, -95 dBm, accuracy must be maintained within ±1 db (tr. 12/204-05).

8-5. Paragraph 3.6.17.2.5 did not specify what power level (db of isolation) would be necessary to maintain an accuracy requirement of ±1 db. How the accuracy requirement would be met was left up to the contractor. (Tr. 12/148) Daugherty testified that the Government had no interest "in the exact number of db of isolation required. All we were interested in was the end result of getting an un-degraded signal out the front jack" (tr. 12/175). NavCom argued at the hearing that ¶ 3.6.17.2.5 was a last-minute addition. Even so, it acknowledged that it read and understood the requirement, and considered the requirement before it submitted its proposal. (Tr. 12/73-74)

8-6. The isolation required to maintain the accuracy required (±1 db) had to be calculated. To calculate this isolation factor, one had to know (1) the output range (0 to -95 dBm), (2) the accuracy required (±1 db), and (3) whether the signal is coherent or incoherent. (Tr. 12/214, 222-23) Whether the signal is coherent or incoherent is design dependent. It would depend on whether the contractor chose to use one, two or three oscillators (tr. 12/227, 13/70).

NavCom's Proposal

8-7. NavCom's proposal was not incorporated as a part of the 155 Contract. Since the Government had changed the R&D specification, the purpose for requiring a proposal from both NavCom and Hazeltine was to see how they would implement the changes for production (tr. 13/92).

8-8. NavCom's 6 February 1998 proposal stated:

> . . . To operate one channel at 0 dBm and the other channel at -95 dBm requires *over 100 dB* of isolation. . . . The isolation in the combined mode switch is in excess of 100 dB.

(Emphasis added) (R4, tab 17 at 001520; tr. 12/76, 13/70)

8-9. In proposing "over 100 dB of isolation," NavCom acknowledged that it took into account the "worst case scenario." This scenario meant that "[o]ne channel would be at 0 [db] one channel at minus 95 [db]." (Tr. 12/149-50).

8-10. NavCom also acknowledged that it was up to the contractor to calculate the necessary isolation. In this connection, NavCom "did a quick calculation," and found that "about 100 db of isolation" would be needed so that one channel would affect the other by less than ±1 db (tr. 12/74).

8-11. NavCom's calculation actually showed that 102 db of isolation was required. In its proposal, NavCom "rounded off to greater than 100 db." (Tr. 12/162-64). It was determined ultimately that 120 db was required (tr. 12/77, 88, 151). Van Cleave explained that 120 db "is not 20 percent more than 100 db. It is 100 times as much. 20 db is a factor of 100" (tr. 12/77).

8-12. Van Cleave testified that when NavCom proposed an isolation of over 100 db, it really meant "100 db minimum. 100 is enough. More is okay too" (tr. 12/150). In coming up with 102 db, NavCom made a mistake because it used a formula for incoherent signals rather than coherent signals (tr. 12/82). He also acknowledged that had NavCom used the correct formula, it would have recognized that it needed 120 db (tr. 12/84). Not knowing what specific design NavCom was going to use, we find the Government had no reason to go behind NavCom's proposal to calculate the power level required. We find also that the Government could not reasonably be expected to know, when NavCom proposed "over 100 dB of isolation," it meant something close to 100db (R4, tab 17 at 001520).

8-13. Although NavCom acknowledged that 100 db of isolation was not enough to meet the specification requirement and it needed 120 db, NavCom considered 120 db to be "just an outrageous isolation" (tr. 12/84, 86). Van Cleave testified that there was no "real world requirement" or application to maintain an accuracy of ±1 db when the output of one channel was 0 db and the output of the other channel was -95 db (tr. 12/122). NavCom contends that if the Government had been willing to change the worst case scenario from 0 db to -95 db to 0 db to -85 db, it "would have been able to easily meet the specification" (tr. 12/82). The Government insisted on a worst case scenario because users "could inadvertently leave one channel full blast and the other one weak" during testing (tr. 12/123).

Hazeltine's Proposal

8-14. At the time NavCom was competing with Hazeltine for the production contract, Joseph Dooley (Dooley) was working for Hazeltine as an RF engineer. He subsequently went to work for NavCom. (Tr. 12/184-86)

8-15. In evaluating the requirement of ¶ 3.6.17.2.5 for Hazeltine's proposal, Dooley determined that 120 db of isolation would be required (tr. 12/221). Since Hazeltine's then existing design (the 150 RTS) had only 102 db of isolation, it would have to change the design to obtain 120 db of isolation (tr. 12/190). Even though it knew what it proposed

would not meet ¶ 3.6.17.2.5, Hazeltine decided to limit the range of attenuator values "from the requisite 0 to 95 db range . . . to a 0 to 60 db range" (tr. 12/191). Hazeltine proposed:

> 3.2.3.4.2 Dual Modulator
>
> . . . .
>
> . . . . For independent RF output levels, the accuracy tolerance of ±1 dB is maintained over a 60-dB differential attenuator setting when the MAIN and AUX channels are CW modulated or modulated with time coincident pulses.

(ASR4, tab 619 at 002589-90; tr. 12/195)

8-16. The Government did not ask Hazeltine to revise or clarify this aspect of its proposal (tr. 12/198). Blaylock testified that had the Government noticed the discrepany, it would not have accepted Hazeltine proposal. We find that the Government simply overlooked Hazeltine's proposed deviation.

Performance

8-17. NavCom submitted its first article test procedures for the 155 RTS by letter dated 31 August 1990. The Government's 25 October 1990 comments stated:

> This procedure should check the modulation ratios with maximum coupling. . . . When checking the MAIN, the AUX should have maximum power output and worst case modulation.

(R4, tab 37 at 003652; tr. 12/78-79) What the Government wanted to see was "maximum coupling."[13] This means the Government wanted to see "this particular feature tested absolutely worst case with one channel wide open maximum and the other one at absolute minimum" (tr. 12/79).

8-18. To obtain ±1 db at maximum coupling, NavCom had to work on (1) the RF interface, (2) the coupler assembly, (3) the modulator assembly, and (4) the RF generator assembly (tr. 12/153). Van Cleave testified that to attain "[t]he first 90 or so db is easy . . . to go to 100 db was doable with some good work . . . . To get to 110 db, we were talking about another factor of ten now, [and that] is very, very difficult. And to go to 120 is just outrageously difficult" (tr. 12/103).

8-19. NavCom claimed $857,622, for allegedly redesigning and producing the first articles with the capability of maintaining ±1 db accuracy with maximum coupling (Claim at 409).

DECISION

CHANNEL TO CHANNEL ISOLATION (Claim No. 8)

The specification requirement in this claim is straightforward. The MAIN RF output channel is required to have an RF output level ranging from 0 to -95 dBm (¶ 3.6.17.2.1). The AUX RF output channel is also required to have an RF output level ranging from 0 to -95 dBm (¶ 3.6.17.2.2). Paragraph 3.6.17.2.5 requires that during independent RF operation, an accuracy tolerance of ±1 db of signal generator power be maintained regardless of where the attenuator of each channel is set. This clearly include the situation when the MAIN RF output channel is set at one extreme (*i.e.,* 0 dBm), and the AUX RF output channel is set at the other extreme (*i.e.,* -95 dBm), and vice versa.

NavCom contends that the channel settings did not need to be at 0 and -95 db because there was no operational requirement for such a condition (app. br. at 9-10). This argument has no merit. As a matter of law, the Government is entitled to what the contract demands. *Jack Stone Co.*, 344 F.2d at 376; *Maxwell Dynamometer Co.*, 386 F.2d at 868. In this case, the Government required accuracy at "maximum coupling" or "worst case scenario" because users could inadvertently leave one channel at "full blast" and the other at its weakest extreme during testing.

NavCom's contention that ¶ 3.6.17.2.5 was a last-minute addition to the specification, and that it did not fully understand the requirement when it submitted its proposal provides no ground for relief (app. br. at 9-10). Paragraph 3.6.17.2.5 was a part of Attachment (2) to MIL-T-24664(EC) forwarded to NavCom before it submitted its proposal. We have found that NavCom read and understood the requirement, and considered the requirement before it submitted its proposal. The evidence shows that, to the extent NavCom did not realize that 120 db was actually needed to maintain accuracy at maximum coupling, it was due to NavCom's own mistake in using the wrong formula in its calculation. NavCom acknowledged that had it used the correct formula, it would have realized that it needed 120 db.

NavCom contends that given the operational needs of the equipment to be tested, and the failure of the specification "to identify the main and aux channel attenuator settings," it reasonably interpreted the specification to require accuracy of ±1 db between attenuator settings of between 0 to -85 db (app. br. at 10-12). As support, NavCom contends that Hazeltine interpreted the requirement the same way it did, and "[t]he Navy accepted Hazeltine's proposal because the proposal was reasonable" (app. br. at 12).

We do not agree that ¶ 3.6.17.2.5 is rendered defective simply because it did not identify the main and aux settings. Paragraph 3.6.17.2.5 required that the specified accuracy tolerance of ±1 db be maintained regardless of the attenuator setting of the MAIN

and AUX RF output. Since both of these outputs have a range of RF output level of 0 to -95 db, we conclude that the requirement is clear. To the extent the Government accepted Hazeltine's proposal, we have found the Government simply overlooked Hazeltine's nonconforming proposal. The Government's witness testified that had the Government noticed it, the Government would not have accepted Hazeltine's channel to channel isolation proposal.

NavCom also alleges that it is entitled to relief because of mutual mistake. It contends that "[b]oth NavCom and the Government were mutually mistaken in assuming that no significant 149 RTS redesign would be required because only 100 dB of isolation would be needed to maintain the required accuracy, even with a 95 dB signal differential" (app. br. at 15).

To prevail under the theory of mutual mistake, NavCom has to prove four elements:

(1) the parties to the contract were mistaken in their belief regarding a fact;
(2) that mistaken belief constituted a basic assumption underlying the contract;
(3) the mistake had a material effect on the bargain; and
(4) the contract did not put the risk of the mistake on the party seeking reformation.

See RESTATEMENT (SECOND) OF CONTRACTS §§ 151-152, 155 (1981); *National Presto Indus., Inc. v. United States*, 338 F.2d 99, 107-109, 167 Ct. Cl. 749 (1964), *cert. denied*, 380 U.S. 962 (1965); *Atlas Corp. v. United States*, 895 F.2d 745, 750 (Fed. Cir. 1990), *cert. denied*, 498 U.S. 811 (1990).

NavCom has failed to prove at least two of the four elements. Taking the fourth element first, the contract clearly puts the risk of mistake on NavCom. Paragraph 3.6.17.2.5 is a performance type specification. It required NavCom to meet a ±1 db accuracy requirement regardless of the attenuator setting of the MAIN and AUX output channels. It was up to NavCom to design a test set to meet this performance requirement. We conclude that ¶ 3.6.17.2.5 is a performance type specification. *See J.L. Simmons*, 412 F.2d at 1362. NavCom used the wrong formula and calculated that a power level of 102 db would be required to maintain the required accuracy (±1 db) at a 95 db differential between the MAIN and AUX channels. It acknowledged that had it used the correct formula, it would have calculated that 120 db was necessary. Whether NavCom should have used the formula for coherent or incoherent signal was design dependent. Since NavCom was charged with designing the test set to meet the accuracy requirement between channels, we conclude that the contract put the risk of mistake on NavCom. *See Flippin Materials Co. v. United States*, 312 F.2d 408, 415 (Ct. Cl. 1963) ("a mutual mistake as to a fact or factor, even a material one, will not support relief if the contract puts the risk of such a mistake on the party asking reformation"); *McNamara Const. of Manitoba, Ltd. v. United States*, 509 F.2d 1166, 1169 (Ct. Cl. 1975) (risk of labor strife placed by contract on contractor).

NavCom also failed to prove the first element. It has failed to prove that the Government was also mistaken in accepting NavCom's proposal. NavCom's proposal provided that "[t]o operate one channel at 0 dBm and the other channel at -95 dBm requires over 100 dB of isolation." Not knowing what specific design NavCom was going to use, the Government had no reason to go behind NavCom's proposal to calculate the power level required. Moreover, the Government could not reasonably be expected to know, when NavCom proposed "over 100 dB of isolation," it meant something close to 100 db.

CONCLUSION

Because the Government was, as a matter of law, entitled to what its contract demanded, we hold that NavCom was required to provide sufficient isolation (120 db) to maintain the required accuracy (±1 db) at no less than maximum coupling (0 to -95 db).

Because the requirement of ¶ 3.6.17.2.5 was provided to NavCom before it submitted its proposal, and because NavCom read, understood and considered the requirement before it submitted its proposal, we hold that NavCom is not entitled to relief on the basis that the requirement was a last-minute addition to the specification.

Because NavCom has failed to prove that both it and the Government were mistaken in their belief that only 100 db of isolation would be needed to maintain the required accuracy at maximum coupling, and because it has failed to prove that the specification did not put the risk of the mistake on NavCom, we hold that there was no mutual mistake.

Accordingly, NavCom's appeal in connection with Claim No. 8 is denied.

ASBCA No. 52296 - Claim No. 13
GOVERNMENT-FURNISHED EQUIPMENT (GFE)
FINDINGS OF FACT

13-1. MIL-T-24664(EC) required the 155 RTSs to be able to conduct automatic test and evaluation of IFF equipment (interrogators and transponders) specified in ¶ 3.6.19.2. (R4, tab 15 at 000996). The RTSs were required to test the following IFF equipment automatically:

> 3.6.19.2 Automatic testing. The equipment [also known as Analog Controller Mutiplexer or ACM] shall contain all circuitry required to test the IFF equipment specified in a through m:
>
> Interrogators Transponders

a. AN/APX-76 System
b. AN/APX-103
c. AN/TPX-54
d. AN/UPX-23
e. AN/UPX-27
f. RT-868 ( )/APX-76
g. RT-988 ( )/APX-76
h. AN/APX-64
i. AN/APX-100
j. AN/APX-101
k. KY-532/ASQ
l. KY-533/ASQ
m. RT-859 ( )/APX-72

(R4, tab 15 at 000997)

13-2. To enable NavCom to test the ACMs during first article testing, the specification provided for certain GFE. Pursuant to Special Provision H-14 GOVERNMENT PROPERTY FOR THE PERFORMANCE OF THIS CONTRACT (FIXED-PRICE) (APR 1985) (NAVAIR 52.245-9500), the following "Agency Peculiar Property" were to be provided:

Item	Quantity
RT-727/APX-64	1
AN/UPX-23	1
AN/UPX-27	1
RT-868 ( )/APX-76	1
RT-859 ( )/APX-72	1
RT-1284/APX-100	1
RT-1157/APX-100	1
RT-1063B/APX-101	1
KY-532A/ASQ	1
SN-416( )/APX-76(V)	1
SA-1568A/APX-76(V)	1

(R4, tab 15 at 000760)

13-3. As found previously, under the 155 Contract, the Government wanted the active circuitry in the RTS moved to a separate assembly. This separate assembly came to be known as the ACM. The specification required the following for this assembly:

> 3.6.19.2.2 Interface cable assembly. Each UUT shall have a unique interface cable assembly for automatic testing. The assembly shall consist of a small interface board with a cable and connector to mate with the AUTO TEST connector on the front panel of the equipment, and the cables and connectors required to connect with the UUT to be tested. . . . The interface board shall have the PROM containing the AUTO TEST software for the associated UUT. Active circuitry shall be allowed in the interface devices . . . .

(R4, tab 15 at 000998)

13-4. Section I of the 155 Contract incorporated FAR 52.245-2 GOVERNMENT PROPERTY (FIXED-PRICE CONTRACTS) (APR 1984). This clause provided, in part:

> (a) *Government-furnished property*. (1) The Government shall deliver to the Contractor, for use in connection with and under the terms of this contract, the Government-furnished property described in the Schedule or specifications together with any related data and information that the Contractor may request and is reasonably required for the intended use of the property (hereinafter referred to as "Government-furnished property").
>
> (2) The delivery . . . dates for this contract are based upon the expectation that Government-furnished property suitable for use . . . will be delivered to the Contractor at the time stated in the Schedule . . . .
>
> . . . .
>
> (4) If Government-furnished property is not delivered to the Contractor by the required time, the Contracting Officer shall, upon the Contractor's timely written request, make a determination of the delay, if any, caused the Contractor and shall make an equitable adjustment in accordance with paragraph (h) of this clause.
>
> (b) *Changes in Government-furnished property*. (1) The Contracting Officer may, by written notice . . . (ii) substitute other Government-furnished property for the property to be provided by the Government, or to be acquired by the Contractor for the Government, under this contract.
>
> (2) Upon the Contractor's written request, the Contracting Officer shall make an equitable adjustment to the contract in accordance with paragraph (h) of this clause, if the Government has agreed in the Schedule to make the property available for performing this contract and there is any --
>
> (i) Decrease or substitution in this property . . . .

. . . .

(h) *Equitable Adjustment.* When this clause specifies an equitable adjustment, it shall be made to any affected contract provision in accordance with the procedures of the Changes clause. . . . The right to an equitable adjustment shall be the Contractor's exclusive remedy. The Government shall not be liable to suit for breach of contract for --

(1) Any delay in delivery of Government-furnished property;

. . . .

(3) A decrease in or substitution of Government-furnished property . . . .

(R4, tab 15 at 000797)

13-5. The RFP initially did not require the specified GFE to be provided within a specific time period (tr. 15/35). In answer to a question posed by an offeror, the Government issued Amendment No. 0002, dated 22 January 1988, to the RFP. Paragraph 4.M. of the amendment provided, in part, that "All GFE will be delivered to the Contractor not later than 45 days after contract award" (R4, tab 15 at 001173; tr. 14/152, 15/13). Since the 155 Contract was awarded on 3 February 1989, we find that the Government was required to deliver the GFE by no later than 20 March 1989.

13-6. NavCom began designing the ACM interface board before it received all of the GFE. According to NavCom, working under a 16-month first article schedule, it could not afford to wait for all of the GFE. (Tr. 14/36) NavCom's initial approach was to design a common or universal interface board so that one ACM could interface and test all of the UUTs (tr. 14/125-26). This approach was based on the assumption that one interface board "would be able to provide all of the control interfaces and all of the response interfaces required to perform the tests" (tr. 14/36). NavCom expected that manufacturing and logistical costs would be lower if this approach was successful (tr. 14/50-52). Thus, NavCom initially built a "box" with about 50 interfaces based on information that was available at the time of contract award. NavCom's assumption was that "within those pre-defined 50 interfaces, as information came in from the . . . [GFE], they could be mapped into those 50 basic interface lines" (tr. 14/37). Other than the foregoing time and cost savings considerations, NavCom provided no evidence that it conducted the necessary investigations to ensure that its single, all-purpose ACM design was technically feasible.

13-7. By June 1989, four months into the contract, NavCom was "working on the paper design for eventual implementation of . . . [the] design into actual hardware" (tr. 14/48). After it had received all of the GFE and GFE substitutes, NavCom by letter dated 16 August 1989 sent the Government a summary of "the GFE status." The summary showed that out of 12 pieces of GFE, 9 pieces were delivered late. Six of the nine pieces were delivered in April 1989, one piece was delivered in July 1989, and two in August 1989:

GFE	Due Date	Actual Delivery Date
AN/UPX-23	03/20/1989 [14]	03/09/1989
AN/UPX-27	03/20/1989	03/09/1989
SN-416A/AN/APX-76(V)	03/20/1989	04/05/1989
SA-1568A/APX-76(V)	03/20/1989	04/25/1989
RT-868A/APX-76(V)* [15]	03/20/1989	04/11/1989
RT-728A/ APX-64(V)*	03/20/1989	04/11/1989
RT-731A/APX-64(V)* [16]	03/20/1989	04/05/1989
RT-859A/APX-72	03/20/1989	03/09/1989
RT-1284/APX-100	03/20/1989	08/10/1989
RT-1157A/APX-100	03/20/1989	07/11/1989
RT-1063C/APX-101(V)	03/20/1989	04/05/1989
KY-532B/ASQ*	03/20/1989	08/08/1989
KY-533A/ASQ [17]		

NavCom's letter stated that it received the last piece of GFE, "on 10 August 1989 and can now begin to assess the impact of both the late GFE and the GFE substitutions." (ASR4 tab 661).

13-8. Interface information is derived, in the first instance, from technical manuals which indicate "the number and type of interfaces . . . [and] how interfaces operate and their levels" (tr. 14/55). Schematics, which are a part of technical manuals, are used to design interface circuitry (tr. 14/46-47). According to NavCom, the GFE were used to validate NavCom's design based on the information contained in the technical manuals, and since there was no interface specification, the GFE were needed because it had to "reverse engineer" the GFE "to find out what the interfaces were" (tr. 14/55, 193).

13-9. According to NavCom, as the GFE arrived, and as it obtained more and more interface information from the technical manuals and schematics, it discovered that it had to add more interfaces than the 50 or so it initially designed into the interface board (tr. 14/37-38). By late August 1989, NavCom concluded that the universal interface board had become too large and too complex to build, and the cost advantage of building a single, all-purpose ACM would not materialize. NavCom decided to abandon its universal ACM design (tr. 14/31-32, 49, 126). NavCom contends that had the Government delivered all of

the GFE on time, it would not have taken until August 1989 to come to the conclusion that the universal design was not feasible. NavCom's engineer (Dooley) acknowledged that the universal ACM design was not viable:

> A. If all of the equipment and all of the information were available on time, the . . . obvious conclusion would have been that the universal ACM design concept was not viable, and we would have initially begun the design approach to separate those into different circuit cards.

(Tr. 14/39)

13-10. NavCom ultimately had to design five interface boards for the ACMs, "four significantly different ones, and . . . a fifth one . . . [that was] slightly different than the other four" (tr. 14/190). NavCom had to split the interrogators away from the "transponder[s]," and ended up with two interface boards for the interrogator ACMs and two interface boards for the transponder ACMs (tr. 14/127-28). The Government began first article testing in March 1991, and completed such testing 14 months later, in May 1992 (tr. 15/76). There is no evidence that, contemporaneous with the late receipt of GFE, NavCom asked the CO for schedule relief with respect to the submission of the first article test report (tr. 14/123-25, 217-18). There is no evidence first article testing was delayed as a result of the need to redesign the ACM.

13-11. During the course of performance, the Government would have made available to NavCom through the proper depot whatever technical manuals and schematics it did not have (tr. 15/18-20). For example, in June 1989, NavCom reported that the technical manual for the APX-100 did not contain sufficient information to determine the requirement for automatically testing the equipment (Claim at 637; tr. 14/33). When the issue was raised, Blaylock referred NavCom to the proper Navy facility in Pensacola, Florida, where the schematics were obtained (tr. 14/117). There is no evidence that the lack of technical manuals or schematics impeded NavCom's design efforts. In addition, during the course of performance, NavCom was given "access to any of the equipment specialists within the services." It was also given access to Government sites "to look at actual equipment and discuss it with the people." (Tr. 15/17)

13-12. At a meeting held on 12 October 1989, NavCom's program manager indicated that "there might be an issue for late GFE and the substitution," and he "intended to hold that [the issue] until the end of the contract" (tr. 14/157-58). The CO, however, wanted NavCom to put the issue on the table. Her 24 October 1989 memorandum to NavCom stated:

> 2. NavCom is hereby requested to submit a proposal, complete with supporting documentation, to substantiate the allegation

> that it has suffered adverse impact as a result of the Governments [sic] late provision of Government Furnished Property (GFP) and the substitution of certain items of GFP. It is requested this proposal be provided not later than 30 days from the date of this letter.

(ASR4, tab 660; tr. 14/158)

13-13. NavCom submitted a request for equitable adjustment (REA) dated 5 April 1990 (R4, tab 34; tr. 14/161). NavCom alleged in its REA that it needed all the GFE to determine the architecture[18] of the ACM, and to verify the RTS design. It alleged that it "could not finalize the ACM design without the GFE because neither the contract specification nor the available GFE manuals provided all the design characteristics[19] necessary to interface the RTS hardware with the UUTs. Specifically, the specifications and manuals did not provide the load requirements for all the signals emitted from, and received by, the UUT's." (R4, tab 34 at 003366-67)

13-14. With respect to NavCom's allegations, Daugherty, who had 40 years of experience in IFF test sets, answered in a memorandum dated 1 May 1990:

> ACM Configuration
>
> NDE [NavCom] claims that lack of detailed input/output specifications forced them into two reconfigurations of ACM's from the original single ACM. The original concept of a single ACM for testing seven different GFE's is patently ludicrous. First, the prime equipments [sic] are divided between interrogators and transponders, with completely different functions, for which a common circuitry would be unfeasibly complex and self-defeating.
>
> Second, and most important, determination of the most efficient ACM configuration does not depend in any way on low-level details such as I/O voltages and impedances. Rather, it rests on basic commonality of functions (or lack of) and also test configurations required, such as independent or on-line, KI or internal simulation.
>
> This claim is groundless. The GFE they originally had, along with tech manuals, and their EDM experience were all they needed to make the decisions they finally ended up with. It should not be forgotten that Jim Blaylock and myself have

> always made ourselves readily available to answer, or find answers, to specific questions.

(Emphasis in original) (ASR4, tab 684).

13-15. NavCom takes essentially the same position in its 19 May 1995 claim before us. At the hearing, Daugherty reiterated the positions he took in his 1 May 1990 memorandum. He testified that NavCom was "trying to carry commonality too far," and that "[t]he architecture is a matter of functions which you can group together . . . that the arrangement and what kind of breakdown . . . in the final design didn't depend on details like voltage to be measured" (tr. 15/46, 49). According to Daugherty, once the different functions were divided amongst the ACMs, low-level details were simply for "fine tuning" (tr. 15/53). NavCom has not effectively addressed the Government's contention that the interrogators and transponders had completely different functions, rendering a common circuitry or a universal interface board infeasible. That NavCom was forced ultimately to split the interrogator and transponder functions, and to design five interface boards gives credence to the Government's position. Based on NavCom's own acknowledgment, and Daugherty's experience-based opinion, we find NavCom's universal ACM not to be a viable design. Also, based on Daugherty's experience-based opinion that ACM configuration did not depend on low-level details such as I/O voltages and impedances, we find that NavCom did not have to have all of the GFE before it could determine that its universal ACM was not a viable design.

13-16. In Claim No. 13, NavCom seeks $413,791 as the non-recurring costs for having to redesign the ACM with five interface boards after its initial unsuccessful attempt to design a universal ACM. (Claim at 659)

DECISION

GFE (Claim No. 13)

The contract required the Government to deliver certain pieces of GFE not later than 45 days after contract award or by 20 March 1989. Of the 12 pieces of GFE the Government was supposed to deliver, three pieces were delivered early, six pieces were delivered in April 1989, one piece was delivered in July 1989, and the last two pieces were delivered in August 1989. NavCom contends that after it received all of the GFE, it realized that its initial ACM design would be too large and too complex. It abandoned the design and designed five different ACM configurations instead. NavCom acknowledges that its single, all-purpose, ACM was not viable. It contends that, had the Government delivered all of the GFE on time, it would not have taken until August 1989 to come to the conclusion that its universal ACM was not viable. NavCom seeks the cost of its redesign effort.

We have consistently held that a contractor is entitled to recover increased costs of performance resulting from the Government's failure or delay in delivering GFP as provided in the contract. *Fraass Survival Sys., Inc.*, ASBCA No. 22114, 78-2 BCA ¶ 13,445; *Ingalls Shipbuilding Div., Litton Sys., Inc.*, ASBCA No. 17717, 76-1 BCA ¶ 11,851 (contractor entitled to equitable adjustment because the Government's late delivery of hull steel disrupted production and resulted in delays). In order to recover, however, the contractor must prove that it was adversely affected by the Government's failure to timely deliver GFP. *Leonhard Weiss GmbH & Co.*, ASBCA No. 37574, 93-1 BCA ¶ 25,443 (delay claim rejected because contractor failed to establish that it was delayed by the Government's failure to furnish information or equipment).

NavCom has failed to prove that it was adversely affected by the Government's failure to timely deliver GFE. We have found that NavCom's universal ACM design was not viable because it became too large and too complex when NavCom tried to carry commonality too far. Because NavCom was forced to redesign the ACM as a result of its own flawed design, and not as a result of the late delivery of GFE, we conclude that the Government is not liable for the costs incurred in redesigning the ACM.

NavCom also contends that had the Government delivered all of the GFE on time, it would have concluded that its universal ACM was not viable and would have begun to design interface boards of different configuration instead of the universal interface board. We have found that ACM configuration did not depend on low-level details, and NavCom did not have to have all of the GFE before it could determine that its universal ACM was not a viable design. Moreover, there is no evidence that first article testing was delayed as a result of the need to redesign the ACM.

CONCLUSION

Because NavCom was forced to redesign the ACM as a result of its own flawed universal design, and not as a result of late delivery of GFE, and because NavCom has failed to establish that the late delivery of GFE affected its performance, we hold that NavCom is not entitled to an equitable adjustment.

Accordingly, NavCom's appeal in connection with Claim No. 13 is denied.

ASBCA No. 52292 - Claim No. 2
FIRST ARTICLE TEST PROCEDURES
FINDINGS OF FACT

2-1. Under the 149 Contract, test procedures for Level A testing to ensure compliance with ELEX-T-457A had to be developed. Similarly, under the 155 Contract, test procedures for first article testing to ensure compliance with MIL-T-24664(EC) had to be developed. This claim involves whether NavCom is entitled to recover the costs of

rewriting its updated Level A test procedures which it submitted to meet the requirements of first article testing under the 155 Contract.

2-2. First article inspection under MIL-T-24664(EC) is specified as follows:

> 4.3 First article inspection. Unless otherwise specified (see 6.2), five equipments [sic] shall be required for first article inspection. First article inspection shall consist of all examinations and testing necessary to determine compliance with the requirements of this specification. First article inspection shall include the tests specified in TABLE III.

Table III lists a battery of first article tests, including but not limited to, environmental (temperature and humidity, salt atmosphere, altitude, high impact shock, vibration), EMI, input power, leakage current, voltage and frequency variation, reliability and maintainability tests. (R4, tab 27 at 002690)

2-3. Paragraph 4.5 of MIL-T-24664(EC) specifies the test methods for a number of tests, *e.g.*, the "Satisfactory operating check" (SOC) test (¶ 4.5.3), the "Satisfactory operating test" (SOT) (¶ 4.5.4), the "Environmental tests" (¶ 4.5.5), the "EMI test" (¶ 4.5.8), among others (R4, tab 27 at 002691-92).

2-4. CDRL (Contract Data Requirements List) X003 required NavCom to develop and submit Test Procedures (R4, tab 26 at 002160; tr. 4/158). These test procedures were sometimes referred to as the First Article Inspection Performance Tests (FAIPT).

2-5. The production contract required the first article report to be submitted 16 months after award or by 31 May 1990 (tr. 4/94, 103). By the time the Government awarded the production contract, it no longer simply wanted proof that technology existed to meet its requirements. Rather, it wanted to be assured that the RTSs it procured would actually work in the field. (Tr. 4/128-29) While there were a large number of "qualitative measurements" taken during Level A testing under the 149 Contract, "actual measurements were required for [the] first article" under the production contract (tr. 4/163).

2-6. The Level A tests conducted under the 149 Contract were "not nearly as encompassing as first article tests" (tr. 4/128). Blaylock explained the significance of developing FAIPT under the 155 Contract:

> In first article, you have to ensure that . . . basically every letter of your specification is met. . . . the real driver . . . is whether or not the equipment meets the specification. So when we review procedures for first article, not only do we have to compare them to a DID [Data Item Description], . . . we

> also have to have someone virtually take a spec and lay the test procedure beside it and make sure that . . . they check off every requirement of the spec through the test procedure process.

(Tr. 4/129)

2-7. In preparing its proposal for the 155 Contract, NavCom compared the DID's required by that contract with the DID's of the 149 Contract. Seeing no difference, Van Cleave concluded that "the old test procedures should be good for the production contract" (tr. 3/215-16). In developing the FAIPT for the 155 Contract, NavCom started with its Level A procedures and modified them (tr. 3/58, 239, 4/164). Test procedures were not submitted all at once; they were submitted in groups of 10 to 15 (tr. 4/159).

2-8. On 19 April 1990, the Government faxed a 12-page memorandum of comments to NavCom on its test procedures for the production contract. The introductory paragraphs summarized the problems:

> These performance test procedures are seriously lacking in completeness, especially in the area of specified limit conditions and combinations thereof. The writer suspects that Nav Com [sic] is leaning on EDM design and testing, which was marginal in many areas of measurements, as proving basic design, and they seem to believe that only sample testing is required for first articles.
>
> The accelerated program does not allow for government laboratory testing or OT&E prior to start of production. This is the Navy's only chance to verify that it will be fielding a good test set. The NRL/NESEA EDM test report gave only conditional approval to the EDM and stated that performance must be tightened and improved in many areas before production could begin.

(R4, tab 35 at 003450; tr. 3/240) According to Blaylock, NavCom's first article test procedures contained "very gross errors," and omitted areas of testing required by the specification (tr. 4/161).

2-9. Blaylock explained why NavCom's 155 test submissions, based as they were on the 149 RTS, would not work for the 155 Contract:

> . . . The 149 test procedures would never have tested in the 155. The 155 specification had made dramatic changes from the 149 specification. There were a huge number of

> qualitative measurements done in the Level A of the 149 where actual measurements were required for the first article.
>
> The entire software menu structure for the equipment was different. For the 149 effort, the operator had a book of menus which was, I would say, three-quarters, five-eighths of an inch thick. And to actually set up and run a test, you might have to go to –– for example, the procedure would say, "Select menu 710, press 3, press Enter." You know, it was very detailed as to what to do.
>
> That same language –– a lot of it showed up in the 155 test procedure. However, those menus didn't exist. It was a different menu structure, new software on the unit, new hardware on the unit, and there was absolutely no way that a 149 procedure was going to work on the 155 for performance testing.

(Tr. 4/163)

2-10. The Government's comments caused "extreme chaos" at NavCom – "some people were redesigning modules while other people were trying to push the items into production, while other people were analyzing the requirements all over again" (tr. 3/240, 4/66). As a result of the Government's comments, NavCom submitted multiple revisions of various test procedures. These submissions did not cure the problem. At one point, the NAVAIR program manager was forced to instruct NavCom not to resubmit procedures until it had run the tests and knew that they worked. (Tr. 4/74, 161) While NavCom believed that it was forced to rewrite the first article test procedures to include tests not designed into the 155 RTSs, Blaylock maintained that he was "99.9 percent confident that [the Government] never asked for a test beyond the scope of the contract." (Tr. 4/129-30) NavCom's first article test procedures were not totally approved until January 1992 (GSR4, tab 1254). In the meantime, first article testing began in March 1991 and continued for the next 14 months (tr. 5/28).

SOC and SOT

2-11. The Satisfactory Operating Check (SOC) is performed to make sure that the equipment is functional before a test is commenced (tr. 2/167). The SOC is designed to exercise the maximum circuitry of the 155 RTS with minimum external equipment (tr. 4/133). The test method for the SOC under the 155 Contract is specified in ¶ 4.5.3 of MIL-T-24664(EC):

> Satisfactory operating check. Parameters to be verified and limits of acceptability for the satisfactory operating check, as required by MIL-T-28800, shall be selected by the equipment contractor and be approved by the procuring activity.

(R4, tab 27 at 002692)

2-12. The Satisfactory Operating Test (SOT) is an actual test to ensure the required accuracy of the RTS is being met (tr. 4/134). Unlike the SOC, the SOT requires the contractor to make external measurements to verify that the RTS is running satisfactorily (tr. 2/167, 4/134). The test method for the SOT under the 155 Contract is specified in ¶ 4.5.4 of MIL-T-24664(EC):

> Satisfactory operating test. Parameters to be verified and limits to acceptability for the satisfactory operating test, as required by MIL-T-28800, shall be selected by the equipment contractor and be approved by the procuring activity.

(R4, tab 27 at 002692)

2-13. ELEX-T-457A, the specification for the 149 Contract, contains the same SOC/SOT provisions. The SOC provision is found at ¶ 4.4.4. The SOT provision is found at ¶ 4.4.5 (R4, tab 2 at 000161).

2-14. During the course of the R&D effort under the 149 Contract, the Government was told that NavCom's combined SOC/SOT BIT-only test was "basically measuring to the same accuracy" as the test set capability. Based on this assurance from NavCom, the Government accepted NavCom's SOC/SOT when it "made it through" the BIT. (Tr. 2/167-68)

2-15. When the Government received the actual software deliverables during first article testing on the production contract, it found that NavCom's combined SOC/SOT BIT-only test was merely a functional check of outputs. While NavCom's test "assured that there was an RF signal there," it could not test whether the accuracy of the RTS as required by MIL-T-28800 was being met. At this point, the Government went back and asked NavCom to separate out the SOT feature so that accuracy of the RTS could be tested. NavCom maintains that what it provided was "exactly the way we did it in the UPM-149" under the R&D contract, and was sufficient. (Tr. 3/257, 4/136) NavCom ultimately revised its test to meet the requirement of the specification (complaint ¶ 60).

2-16. NavCom alleged that "[a] large percentage of the growth in the scope of the test procedure preparation effort was due to the Navy's demand that NavCom completely

revise an 'operational' test, commonly referred to as the 'SOT/SOC' issue" (app. br., Claim 2 at 83). NavCom alleged in its claim that:

> The SOT, which began as a combined SOC/SOT BIT-only test, evolved into an automated, ultra-precision measurement of pulse power, pulse frequency, pulse width, pulse spacing, power stability, and frequency stability . . . .
>
> . . . .
>
> What was originally a twelve line procedure for self-test grew into a thirteen sheet document requiring three sets of custom-designed automated laboratory test equipment.

(Claim at 102-03)

2-17. We find that the Government accepted NavCom's combined SOC/SOT BIT-only test on the 149 R&D units based on NavCom's assurance that the test was measuring to the same accuracy as the test set capability. NavCom's assurance later proved to be untrue. Had the Government required a SOT meeting the MIL-T-28800 requirements under the 149 Contract, we find NavCom would have failed that test. Because the SOT under the 149 Contract was not performed to the specification requirements, we find that NavCom knew, or should have known, that it could not be used as a baseline for conducting the same test under the 155 Contract. NavCom has provided no proof that what the Government required in terms of SOT accuracy under the 155 Contract exceeded the requirement of MIL-T-28800.

Unit Under Test (UUT) Fault Isolation

2-18. Paragraph 3.6.19.2 of MIL-T-24664(EC) provides, in part:

> . . . Upon completion of the AUTO test, the equipment shall display a summary menu of all tests that failed and shall list in order of *decreasing probability*, the failed modules of the UUT. . . .

(Emphasis added) (R4, tab 27 at 002674) This was a new requirement for the production contract.

2-19. NavCom's proposal promised the following at ¶ 4.6.19.2, "Automatic Testing":

> The Autotest feature is a powerful feature of the Test Set. It allows complete error free testing of interrogators and transponders by relatively inexperienced personnel especially

> for routine acceptance procedures . . . Fault isolation routines are automatically performed by the Autotest to isolate discrepant subassemblies in most cases. Test results are displayed in direct digital format and easily interpretable.
>
> . . . .
>
> Fault isolation routines programmed into the auto test feature systematically isolate problems to the errant subassembly. Fault isolation subroutines are similar to those developed for the UUTs. These routines proved to be extremely effective in isolation [sic] faults on the R&D test sets.

(R4, tab 17 at 001542-43)

2-20. According to NavCom, listing in order of decreasing probability the failed modules of the UUT is very difficult (tr. 3/103). In order to do what the specification required, NavCom would have to have "knowledge of every single UUT, the engineering and design of those UUT's, where all of the resistors and connectors and everything are, why they are there, what assembly they are on . . . [and] to *fault isolate* between one module and another" (emphasis added) (tr. 3/186-87).

2-21. Because listing failed modules in the UUT in order of decreasing probability of failure was difficult, NavCom chose simply to list the modules that failed. This approach involved "a fairly simple test" and minimum effort (tr. 3/103). NavCom acknowledged that to simply list the failed modules could be done with no testing at all by simply taking "the reliability prediction data for the UUT" (tr. 3/187).

2-22. The Government did not consider NavCom's listing approach satisfactory and asked NavCom to submit a test procedure for fault isolation "to the particular assembly" (tr. 3/103-04). In response, NavCom sent a letter to the Government stating essentially that "[w]e are just fed up, we're not going to do this" (tr. 3/105). Ultimately, the Government did not insist that NavCom list faults in decreasing order of probability when NavCom demonstrated that the equipment did have some form of fault isolation capability (tr. 3/105, 4/198, 5/44). NavCom seeks the cost for writing the test procedures for UUT fault isolation which it described as "a string of test procedures that we wrote . . . taking us to the end of the earth" (tr. 3/105).

2-23. While difficult to do, we find that listing faults --in decreasing probability the failed modules of the UUT -- was required by ¶ 3.6.19.2 of MIL-T-24664(EC). We find, therefore, writing a test procedure for it did not exceed the requirement of the contract.

Frequency and Power Measurements

2-24. NavCom also alleges that a substantial part of the test procedure revisions was the Government's requirement that "NavCom test the RTS for frequency accurately at 'randomly' chosen (and therefore uncalibrated) frequency selected by the Navy at the time of the FAIPT" (app. br., Claim 2 at 63-64). Whether NavCom is entitled to recover for the costs of revising the test procedures depends on the outcome of Claim No. 4 (Measurement Module (Pulsed Frequency Accuracy)).

2-25. In Claim No. 4, we rejected NavCom's contention that it was obligated to produce a measurement module that could measure pulsed frequencies accurately at pre-determined calibrated points only. We denied NavCom's appeal in Claim No. 4, holding that "the Government properly insisted that NavCom's production RTSs meet the specification requirement for pulsed frequency accuracy between 12 and 1200 MHz."

2-26. Whether NavCom is entitled to recover the costs for revising the test procedures also depends on the outcome of Claim No. 5 (Scaler/Demodulator Module (Power Measurement)). In Claim No. 5, NavCom contended that it was entitled to conduct accuracy measurement of power under the 155 Contract in the same way it conducted the measurement under the 149 Contract, *i.e.*, at predetermined and calibrated frequency points. We denied NavCom's appeal in Claim No. 5, holding that "the Government properly insisted that NavCom's production RTSs meet the specification requirement for power accuracy throughout the specified ranges."

Environmental and Electromagnetic Interference (EMI)

2-27. First article inspection includes the tests specified in Table III, ¶ 4.3 of MIL-T-24664(EC). Table III shows that "Environmental" testing includes temperature and humidity, salt atmosphere, altitude, high impact shock and vibration. It also shows EMI (Electromagnetic Interference) testing, among others.

2-28. Whether NavCom was required to write first article test procedures for "Environmental" and EMI testing depends on the question of whether the ACMs are a part of the "First Article Unit." On this question, we have decided that the ACMs are a part of the "First Article Unit." As a consequence of this decision, NavCom was required to write an EMI test plan to include the ACM, and to write test procedures for the ACM drop test, which it proposed as a substitute for the high impact shock test.

DECISION

FIRST ARTICLE TEST PROCEDUES (Claim No. 2)

At the hearing, NavCom presented this claim first. Since this claim depends on whether the ACM was a part of the "First Article Unit," and the outcomes of Claim Nos. 4 (relating to pulsed frequency accuracy testing) and Claim No. 5 (relating to power measurement), we believe it is more appropriate to decide Claim No. 2 at this juncture, after we have examined the merits of Claim Nos. 4 and 5.

In Claim No. 2, NavCom claims the costs incurred when the Government allegedly "greatly expand[ed]" the first article test procedures (app. br., Claim No. 2 at 59-60). NavCom contends that it reasonably concluded that updating the Level A test procedures would be sufficient for purposes of preparing the first article test procedures required under the 155 Contract.

NavCom's argument that a mere update of the Level A test procedures would be sufficient as the first article test procedures cannot withstand scrutiny on the basis of the record before us. Even though that might have been Van Cleave's impression, we have found those within NavCom actually involved in the development of the EDMs understood that Level A testing was not comprehensive and the Government would conduct further operational testing after the EDMs were delivered. We have found that those from NavCom involved with the 149 Contract did not expect that the results of Level A testing would establish the testing criteria for subsequent RTS production units. (Finding 20)

Contrary to what Van Cleave believed, no thorough and elaborate testing was conducted on the 149 EDMs. The evidence shows that, because NavCom was a year late in delivering the EDMs, the Government ran out of money. Consequently, the Government deleted certain tests such as EMI testing. (Finding 18) The Government also considered Level A testing merely a "spot check," for example, although ELEX-T-457A required a full range of environmental testing, the Level A test procedures required testing only at ambient temperature (findings 15, 19). Furthermore, the evidence shows that there were a huge number of "qualitative" measurements done in the Level A testing. While such "qualitative" measurements might be acceptable for R&D as proof of concept, it was clearly not acceptable when the RTSs under the production contract was intended to be deployed for use in the field. We have found the EDMs were never tested to the point where full scale production could be undertaken, and even though NavCom was meeting the approved Level A test procedures, it was not meeting the requirements of ELEX-T-457A.

In addition to the specification refinements the Government made and shared with NavCom after delivery of the EDMs in 1985, there were "dramatic" changes between the R&D EDMs and the production RTSs (finding 2-9). We have found that removing the active circuitry from within the RTS to an ACM external to the RTS was a major change in

design. Moreover, NavCom itself made major changes to the R&D EDMs. It consolidated the six modules in the R&D EDMs into three as a way of easing the burden of calibration and to cut cost.

CONCLUSION

Because (1) the EDMs delivered under the 149 Contract were not fully tested, (2) "dramatic" specification changes had been made to ELEX-T-457A, (3) major design changes had been made in NavCom's proposal, and (4) the Government's requirement for first article testing and approval prior to production, we hold that NavCom is not entitled to an equitable adjustment for rewriting its updated Level A test procedures to meet the requirements of the FAIPT under the 155 Contract.

Because the SOT under the 149 Contract was not performed to the specification (ELEX-T-457A) requirements, and because NavCom knew, or should have known, that it could not be used as a baseline for conducting the same test under the 155 Contract, we hold that writing a test procedure for SOT did not exceed the requirement of the 155 Contract.

Because listing faults -- in decreasing probability the failed modules of the UUT -- was required by ¶ 3.6.19.2 of MIL-T-24664(EC), we hold that writing a test procedure for it did not exceed the requirement of the contract.

Because the Government properly insisted that NavCom's production RTSs meet the specification requirement for pulsed frequency accuracy between 12 and 1200 MHz, we hold that writing a test procedure for it did not exceed the requirement of the contract.

Because the Government properly insisted that NavCom's production RTSs meet the specification requirement for power accuracy throughout the specified ranges, we hold that writing a test procedure for it did not exceed the requirement of the contract.

Because the ACM is a part of the "First Article Unit," we hold that writing test procedures for the ACM drop test (part of environmental testing) and EMI tests did not exceed the requirements of the contract.

Accordingly, NavCom's appeal in connection with Claim No. 2 is denied.

ASBCA No. 52292 - Claim No. 6
CW 1030 ISOLATION
FINDINGS OF FACT

6-1. Paragraph 3.16.17 of MIL-T-24664(EC) pertains to the "RF section" of the RTS. It provides, in part:

> 3.6.17 RF section. The RF section shall contain two signal generators . . . attenuators . . . coaxial switches to permit the generation and measurement of RF signals. It shall be possible to turn off all internal 1090 MHz and 1030 MHz oscillators by KM control.

(R4, tab 15 at 000993)

6-2. Paragraph 3.6.17.1, "Signal generators," provides that "[t]he equipment shall provide the fixed frequency and swept frequency RF output signals specified in 3.6.17.1.1 through 3.6.17.1.6, each of which is selectable by a KM frequency select switch" (R4, tab 15 at 000993).

6-3. One of the RF output signals is the 1030 MHz CW (Continuous Wave) frequency. The 1030 MHz CW signal is a special fixed signal at +15 dBm. It is higher in power than the signal output that comes out of the MAIN or AUX channels. One of its uses is to serve as "a jamming signal in various tests" (tr. 2/79; R4, tab 15 at 000993).

6-4. Paragraph 3.6.17.2, "RF power outputs," provides that "[t]he equipment shall provide power outputs . . . as specified in 3.6.17.2.1 through 3.6.17.2.4" (R4, tab 15 at 000993). Three kinds of RF power output are specified under Paragraph 3.6.17.2: (1) MAIN RF power OUT (¶ 3.6.17.2.1), (2) AUX RF power OUT (¶ 3.6.17.2.2), and (3) CW 1030-MHz power OUT (¶ 3.6.17.2.3) (R4, tab 15 at 000994).

6-5. Paragraph 3.6.17.2.1.1 specifies the accuracy requirement for the MAIN RF power OUT. It provides, in part, that "[f]or fixed frequency operation . . . the output level shall be accurate to within ±1.0 db of attenuator setting." (R4, tab 15 at 000994) Paragraph 3.6.17.2.2.2 specifies the accuracy requirement for the AUX RF power OUT. It provides, in part, that "[f]or fixed frequency operation . . . the output level shall be accurate to within ±1.0 db of the attenuator setting." (R4, tab 15 at 000994)

6-6. Paragraph 3.6.17.2.4, "Combine RF output levels" provides, in part, that "[a] KM switch shall be provided to combine internally the MAIN RF output (see 3.6.17.2.1) and the AUX RF output (see 3.6.17.2.2) and provide the combined signals at the Main RF I/O connector. . . ." (R4, tab 15 at 000994). The MAIN and AUX channels of the RTS are similar and duplicate outputs. They can operate independently under certain conditions and together under other conditions. (Tr. 2/78-79)

6-7. To make sure that the MAIN and AUX outputs accuracy was maintained to within ±1 db when operating independently, the Government added ¶ 3.6.17.2.5 as a part of Attachment (2), "CHANGES to MIL-T-24664(EC)," dated 10 July 1987, when it issued the RFP in December 1987. This paragraph provides:

> 3.6.17.2.5 Independent RF output levels. When KM selected for independent RF operation, the specified accuracy tolerance (±1 db) of signal generator power versus attenuator setting for either channel shall be maintained regardless of the modulation or attenuator setting of the other channel.

(R4, tab 15 at 1029) The purpose for this requirement is to control "cross talk" or "leakage" from one channel to the other. Purity of signal is achieved by requiring a signal accuracy within a tolerance of ±1 db. (Tr. 2/84). NavCom understood this requirement to mean that if the MAIN RF output is set up for -95 db, its accuracy would vary only ±1 db when the AUX RF output is varied from 0 to -95 db (tr. 3/197).

6-8. NavCom designed the RTS with the 1030 MHz CW function being controlled by a menu selection. When the RTS was initially powered up, the switch for the 1030 MHz CW was in an "on" position by default. (Tr. 5/36) The specification is silent with respect to whether the CW 1030 oscillator was supposed to be in the "on" or "off" position when testing for accuracy of the MAIN and AUX RF signals (tr. 5/35, 37).

6-9. During first article testing, with the 1030 MHz CW turned on, the MAIN and AUX RF sometimes gave incorrect readings. This implied that there was "some phase relationship to the CW 1030 oscillator in the test set." (Tr. 5/34) NavCom proposed to turn the 1030CW off in running the MAIN and AUX accuracy test. Because a technician running the RTS could unknowingly leave the 1030 MHz CW power on and thereby obtain distorted test results, the Government requested that the 1030 MHz CW power be turned on and off during testing to insure that any interference was within the accuracy tolerance of ±1.0 db. (Tr. 5/37-40)

6-10. NavCom also suggested a software fix. This proposal was rejected because the Government did not want to limit the capabilities of the RTS (tr. 3/201-02, 5/38, 62). To comply with the Government's requirement for MAIN and AUX RF power output accuracy (±1 db) with the 1030 CW power turned on and off during testing, NavCom had to redesign and change some of the RF cabling and shielding, and modify one of the modules to reduce the amount of interference (tr. 3/202).

DECISION

CW 1030 ISOLATION (Claim No. 6)

The production RTS has three kinds of RF output: MAIN, AUX and 1030 MHz CW. The MAIN and AUX RF outputs could not maintain the specification accuracy requirement of ±1 db with the 1030 MHz CW signal turned on during first article testing. NavCom had to redesign and change the cabling and shielding, and modify one of the modules to reduce

the amount of interference to an acceptable level. NavCom contends that the Government required out-of-scope work because there was no requirement for independence between the 1030 MHz CW signal and the MAIN RF signal, and there was no requirement for independence between the 1030 MHz CW signal and the AUX RF signal (tr. 3/199).

The specification is silent with respect to whether the 1030 MHz CW signal should be turned on or off during RTS operation. For fixed frequency operation, however, ¶ 3.6.17.2.1.1 unequivocally requires that the MAIN RF output level "shall be accurate to within ±1.0 db of attenuator setting." Similarly, for fixed frequency operation, ¶ 3.6.17.2.2.2 requires that the AUX RF output level "shall be accurate to within ±1.0 db of attentuator setting."

Paragraph 3.6.17.2.5 was added to make clear that the ±1 db accuracy had to be maintained during independent operation of the MAIN and AUX channels. This clarification was added because the MAIN and AUX channels could operate in a combined mode. The MAIN and AUX channels are similar and duplicate outputs, and they operate independently under certain conditions and operate together under other conditions. We conclude that this clarification does not detract from the overall requirement that the MAIN and AUX output level for fixed frequency operation has to be within the specified accuracy level of ±1 db. Whether the 1030 MHz CW signal is on or off, we conclude the MAIN and AUX RF signals are required to operate within an accuracy level of ±1 db. We conclude that the Government had set out a performance requirement to be achieved by whatever means NavCom saw fit, and NavCom performed no more than what was required by its contract. *J.L. Simmons Co. v. United States*, 188 Ct. Cl. 684, 689, 412 F.2d 1360, 1362 (1969) (a performance specification set forth an objective to be achieved, and the contractor is expected to use its ingenuity to achieve that objective.)

CONCLUSION

Because the Government simply required NavCom to provide the MAIN and AUX RF output accuracy level (±1 db) the specification required, we hold that NavCom is not entitled to an equitable adjustment for Claim No. 6.

Accordingly, NavCom's appeal in connection with Claim No. 6 is denied.

ASBCA No. 52296 - Claim No. 11
GFE INTERFACE SPECIFICATION DEFECTS
FINDINGS OF FACT

11-1. In April 1990, NavCom submitted to the CO a request for equitable adjustment (REA). A part of this REA dealt with technical manual and GFE discrepancies:

9. Technical Manual and GFE Discrepancies

> In some instances, defects in either the GFE or available technical manuals impacted [NavCom's] performance. . . . In order to compensate for these discrepancies in the GFE, [NavCom] had to modify the ACM designs, make changes to the documentation, and reorder materials.

(R4, tab 34 at 003383)

11-2. The parties entered into bilateral Modification No. P00022 in August 1991. This modification provided at ¶ 1.b.: "Attachment (14), Changes to MIL-T-24664(EC) dated 13 August 1991, attached hereto is incorporated into the contract with full force and effect." Attachment (14) provided:

> This Attachment forms a part of Military Specification MIL-T-24664(EC) dated 28 May 1986. . . .
>
> MIL-T-24664(EC) dated 28 May 1986 is modified as follows:
>
> PAGE 318
>
> 3.6.19.2.2.1b: Delete "(Mode 1)" and substitute with "(Mode 4)".
>
> 3.6.19.2.2.1l: Delete "5 V" and substitute with "15V".
>
> PAGE 319
>
> 3.6.19.2.2.1t: Delete "2.0 V" and substitute with "1.5 V".
>
> PAGE 320
>
> 3.6.19.2.2.2.1i: Delete this step in its entirety.
>
> PAGE 321
>
> 3.6.19.2.2.2.3h: Delete this step in its entirety.
>
> PAGE 326
>
> 3.6.19.2.2.7r: Delete this step in its entirety.

Paragraph 3 of Modification No. P00022 provided that:

> 3. The changes specified herein shall be incorporated at no increase in contract price.
>
> Except as specifically provided herein, all terms and conditions of contract N00019-88-C-0228 remain unchanged and in full force and effect.

(R4, tab 26 at 002509-12)

11-3. Modification No. P00022 deleted or substituted a number of tests required by the specification as a result of alleged defects in the GFE uncovered by NavCom. Some of the GFE deficiency issues resurfaced in a 1995 REA which is the claim before us. The CO testified that she believed Modification No. P00022 released the Government "for effort [by NavCom] associated with analyzing and finding the problems" in connection with five of the claims before us (tr. 14/169). Since Modification No. P00022 was bilateral, and NavCom did not reserve its right to assert further claims, we find NavCom agreed to no increase in contract price with respect to sub-claims 1-1, 1-2, 3-1, 3-2, and 3-3.

11-4. By letter dated 19 May 1995, NavCom forwarded to the CO a $11,338,676 REA consisting of 13 claims. Claim No. 11 of the REA pertaining to "DEFECTIVE INTERFACE SPECIFICATIONS" was for the amount of $825,457.

11-5. Although not in the form of a final decision, the CO by letter dated 18 February 1997, denied all of NavCom's claims except for several sub-claims under Claim No. 11. With respect to these sub-claims, the CO's letter stated:

> In regard to the allegations concerning specification errors, mistakes or omissions, the Contracting Officer finds partial entitlement to the contractor's allegation regarding subissues described as "Incorrect Fault Indication for APX-76(V) Auto Test" [subject of sub-claim 3-1], "Incorrect Self Test and Fault Indication Procedures for APX-76 Test" [subject of sub-claim 3-2], "Conflicting Requirements for Display of STF Reply Codes" [subject of sub-claim 3-5], "Insufficient Specificity of Test-GO and BIT-GO Indications for RT-1157/APX-100 Auto Test" [subject of sub-claim 3-6], "Insufficient Specificity of Test-GO and BIT GO Signals for APX-101 Transponders Auto Test" [subject of sub-claim 3-7], "Unstated Requirements for Distinction Between KIT and On-Line Selection for Mode 4 Test Enable Operation" [subject of sub-claim 2-3] and "KY-532/533 Connector" [subject of sub-claim 4-11]. However, the Contracting Officer cannot

> determine quantum since the contractor's proposal is not sufficiently detailed for the various sub-issues.

(ASR4, tab 669)

11-6. The CO found entitlement on the foregoing issues based on her review of the technical analysis review (TAR) and the legal entitlement memorandum (tr. 14/166). Because NavCom did not price each of the individual sub-claims, the CO was unable to grant a specific amount on each sub-claim for which she found entitlement (tr. 14/164). She asked NavCom for a breakdown proposal. NavCom did not respond. (Tr. 14/165).

11-7. As explained in NavCom's claim, the 155 Contract called for both manual and automatic (auto) testing of GFE UUTs. This testing required interfacing of RTS to each item of GFE. NavCom alleged that the interface data was defective in many ways. It alleged that although Government-furnished manuals and schematics resolved many of the interface problems, there remained 30 interface issues in dispute. (There are 30 interface issues instead of 29 NavCom explicitly claimed because NavCom designated sub-claim 4-4 as 4-3 and counted 4-3 only once.) These interface issues are the subject of Claim No. 11. (Claim at 457)

11-8. NavCom divided the 29 interface issues into four broad categories.[20] The facts surrounding each of the 29 sub-claims were based on Dooley's logs (tr. 14/61). His logs were "a continuous record of events that were occurring during the integration process" (tr. 14/63). In response to Claim No. 11, Government technical personnel prepared a TAR, which NavCom included as a part of its supplemental Rule 4 file (ASR4, tab 739).

11-9. Almost all of the sub-claims involved technical concepts and terminology. During the hearing, NavCom briefly went through a few examples (¶¶ 1-2, 1-3, 2-1, 2-3, 3-1, 3-2, 4-3). The Government asked no questions with respect to any of the sub-claims. NavCom's post-hearing briefs essentially summarized what were already in the REA. The Government's briefs did not address the technical aspects of any of the claims. We are thus left to our own devices on these claims. We therefore decide each sub-claims on the basis of what we are able to glean from the record.

1-1 Incorrect Minimum Voltage for Suppression Gate Output or AN/UPX-23 or AN/UPX-27[21]

11-10. Paragraph 3.6.19.2.2.1l of MIL-T-24664(EC) required NavCom to "[v]erify a suppression gate output of at least 5V" during performance of AN/UPX-23 or AN/UPX-27 interrogator tests (R4, tab 27 at 002675). The technical manuals for the two interrogators specified the suppression gate output as 20 ± 5.0 V (Claim at 459). NavCom alleged that the Government acknowledged the error when the suppression gate output was

changed from 5.0 V minimum to a 15 V minimum by Modification No. P00022 (Claim at 459; R4, tab 26 at 2512).

11-11. The Government contends that:

> This is not a problem. It does not reflect a defective specification. The decision was made if a 5 volt signal was present, the circuit was functioning. . . .
>
> . . . .
>
> This change was made because it was requested by NavCom. They felt it was more appropriate to test for the higher level. The government allowed the change because it did not have a negative impact on the mission of the equipment.

(R4, tab 739 at 003479)

11-12. We find that there was an inconsistency between the specification and the technical manuals. To the extent NavCom is entitled to an equitable adjustment, we find bilateral Modification No. P00022 released the Government. Accordingly, this sub-claim is denied.

1-2 Incorrect Minimum Voltage for Mode 4 Video for AN/UPX-23 or AN/UPX-27 Interrogator AUTO Test

11-13. Paragraph 3.6.19.2.2.1t of MIL-T-24664(EC) required NavCom to "Verify Mode 4 video intended for the KIR of greater than 2.0 V across 75 ohms" during testing of AN/UPX-23 or AN/UPX-27 interrogators (R4, tab 27 at 002676). NavCom alleged that the requirement for 2 V minimum was incorrect because the interrogator design permitted 1.8 V minimum (Claim at 460; tr. 14/72-73).

11-14. NavCom alleged that the technical manuals for the AN/UPX-23 did not specify the correct amplitude for the Mode 4 video signal (Claim at 460; tr. 14/66-67), and that the Navy had experience with the AN/UPX equipment and was aware of its true tolerance (tr. 14/69). NavCom alleged that the discrepancy caused some conforming AN/UPX-23 equipment to have "false failures" (Claim at 461; tr. 14/66).

11-15. In a telephone discussion held on 16 August 1990, the Government indicated to NavCom that the amplitude for this signal should be 2.0 ± 0.2 V (*i.e.*, 1.8 to 2.2 V). (ASR4, tab 739 at 003479). Modification No. P00022 lowered the minimum voltage requirement from 2.0 to 1.5 V (R4, tab 26 at 002512; tr. 14/70-71).

11-16. NavCom alleged that it expended time and labor in discovering the discrepancy and had to change the ACM hardware to accommodate the lower voltage requirement (Claim at 461-62; tr. 14/71).

11-17. According to the Government, testing to "[t]he 2 volt level was fully acceptable," and "[t]his change was made at NavCom's request." Moreover, the Government took the position that NavCom had to redesign the ACM because its original design was inferior and "not due to the GFE limitations." (ASR4, tab 739 at 003480-81) To the extent NavCom is entitled to an equitable adjustment, we find bilateral Modification No. P00022 released the Government. Accordingly, this sub-claim is denied.

1-3 Incorrect Test Condition for Mode 4 Enable for AN/UPX-23 or AN/UPX-27 Interrogator Auto Test

11-18. Paragraph 3.6.19.2.2.1q of MIL-T-24664(EC) required "[w]ith Mode 4 override enabled, verify a Mode 4 enable to the KIR" during testing of AN/UPX-23 or AN/UPX-27 interrogators (R4, tab 27 at 002675). The KIR is a crytographic computer which interfaces with the AN/UPX-23 (tr. 14/74). The MIL-T-24664(EC) specification required that the Mode 4 response could be verified in both the multiplex and non-multiplex modes of the UPX-23 and AN/UPX-27 (Claim at 462; tr. 14/76).

11-19. NavCom alleged that it discovered that the Mode 4 enable response could not be produced in the non-multiplex mode. NavCom contends that the Government acknowledged that it specified an incorrect test condition when it deleted the requirement for producing the Mode 4 response in the non-multiplex mode during the FAIPT. (Claim at 465; tr. 14/83)

11-20. According to the Government, the requirement was "to have an Auto Test that would work regardless of the link settings within the equipment." The Government took the position that the contract requirement could have been met had NavCom "added an operator prompt to identify the mode of operation and provided the required signal from the ACM." The Government stated that it was forced to accept a lesser test because NavCom convinced the test witnesses to allow the unit to pass "because the specification did not reflect the way the GFE operated." (ASR4, tab 739 at 003481)

11-21. NavCom has not addressed the Government's response. We find that NavCom has not proved by a preponderance of the evidence that the specification called for an unachievable test condition. Accordingly, this sub-claim is denied.

1-4 Intended, But Unstated Dependence Between Four Apparently Independent Requirements

11-22. There were four electrical performance requirements in MIL-T-24664(EC). Paragraph 3.6.3.1 required:

> Variable pulses 1 and 2. The equipment shall generate two variable pulses for each PRF. Each pulse shall be capable of being logically ORed with the reply train or the challenge train when selected by the KM controller. . . .

(R4, tab 27 at 002657) Paragraph 3.6.5.1.9 required:

> SIF 1 train and SIF 2 train. The equipment shall have an alternate train mode selected by KM control. The replies to odd interrogations shall be from the SIF 1 and variable pulse 1, and the even replies to interrogations shall be from the SIF 2 train and variable pulse 2. . . .

(R4, tab 27 at 002660) Paragraph 3.6.5.3.1 provided:

> Video output. The selected and delayed replies ORed with the variable pulses, if KM-selected, shall be provided to a separate front panel jack. . . .

(R4, tab 27 at 002660) Paragraph 3.6.6.5.1 provided:

> . . . Both replies may be logically ORed to 1 jack upon KM switch selection. . . .

(R4, tab 27 at 002662)

11-23. NavCom alleged that MIL-T-24664(EC) did not indicate that the four paragraphs at issue were related. It contended that the paragraphs were not sequential, did not cross-reference each other, and were scattered in four separate locations in the specification. (App. br. at 9) NavCom alleged that "[b]y refusing to approve the FAIPT, the Government forced NavCom to redesign the hardware and software to accommodate the intended but unspecified requirements" (App. br. at 10).

11-24. The Government contends that NavCom simply "made a design error by not taking into consideration all of the independent settings possible," and that NavCom should have realized that "the functions must be performed regardless of other settings" (ASR4, tab 739 at 003482).

11-25. NavCom has not explained in an understandable fashion the merits of its claim. Nor has it addressed the Government's position. on this record, we find that

NavCom has failed to prove its case by a preponderance of the evidence. Accordingly, this sub-claim is denied.

1-5 Intended, but Unstated Requirement for Operator Prompt to Set Video Processor Links for Reply Code for AN/UPX-23 or AN/UPX-27 Interrogator Auto Tests

11-26. Paragraph 3.6.19.2.2.1o. required NavCom to "[v]erify a reply code on the receiver video output of 2.0 ± 0.5 V across 75 ohms" during AN/UPX-23 or AN/UPX-27 interrogator testing (R4, tab 27 at 002675).

11-27. The Government informed NavCom during a meeting on 20 September 1989 that "[l]inks settings shall not affect any measurements" (R4, tab 237 at 008070, ¶ 2.C.). This was impossible for the AN/UPX-23 because the receiver video output could only obtain a signal if the A7 video processing link was set for defruiter mode (Claim at 469). NavCom indicated that the best it could do was to inform the operator of the problem. NavCom changed the ACM firmware to prompt the operator to set the A7 video processor link for defruiter in order to obtain a signal on the receiver video output. This solution was accepted by the Government. (ASR4, tab 739 at 003484)

11-28. The specification left it up to NavCom to determine how to verify a reply code on the receiver video output. When the Government's suggestion proved impossible, it allowed NavCom to change the ACM firmware to obtain a signal on the receiver video output. We are unable to find that the Government required NavCom to perform any work beyond the scope of its contract. Accordingly, this sub-claim is denied.

1-6 Government Driven Changes to the Gating CCA to Enable ACTIVE TARGET Gating Using Inputs from an External Synchro Source

11-29. NavCom contends that during FAIPT, the Government required an additional test of azimuth change pulses with external synchro input applied. This requirement allegedly contradicted the contract specification (¶ 3.6.8.2.1) and NavCom's approved approach (app. br. at 11-12).

11-30. The Government's TAR gave this response:

> By NavCom's recount of this problem, it seems that the Government identified a weakness in NavCom's test procedure. Apparently, NavCom chose to ignore the comment and attempted to have the Government approve the procedure by performing a 'dry run.' But during the 'dry run' the same

> weakness was identified and NavCom corrected the design and the test procedure.

(ASR4, tab 739 at 003486)

11-31. The basis of this claim has not been adequately explained by NavCom. Nor has NavCom addressed the Government's comments in the TAR. On the basis of the record, we find that NavCom has failed to prove by a preponderance of the evidence that it is entitled to an equitable adjustment. Accordingly, the sub-claim is denied.

1-7 Unstated Requirements to Produce a Mode 4 Reply with Missing Sync Pulses in APX-72

11-32. Paragraph 3.6.11.3 of MIL-T-24664(EC) required that for each enable trigger logically "ANDed" with a transponder Mode 4 "P4 pulse," a "Mode 4 reply shall be generated" (R4, tab 27 at 002665). According to NavCom, the RTS was designed to accept four challenge video pulses (P1 through P4) from the GFE. The P4 pulse and the enable trigger had to be coincident to produce a Mode 4 reply. (Claim at 470) During testing of the GFE, it was discovered that the GFE did not have the first two pulses (P1 and P2) in the challenge video pulse train from the GFE (Claim at 470; R4, tab 227 at 007897). The CMG (Challenge modulator generator) CCA of the RTS was redesigned to account for the fact that the first two pulses of the GFE challenge video pulse train were missing (Claim at 471).

11-33. The Government's TAR contended that NavCom erroneously assumed that "the video from a live system would be exactly like the specification for the interrogation that they were generating" whereas "the signal processing in the transponder system omits some of the pulses." The TAR also stated that the information was "readily available to NavCom in the technical documentation that had been provided from the preparation of the proposal . . . [and] NavCom did not take the time to examine the data they had been provided" (ASR4, tab 739 at 003486).

11-34. Neither party further elaborated on this issue. Nor did NavCom address the Government's defense in the TAR. On the basis of the evidence in the record, we find that NavCom has failed to prove by a preponderance of the evidence that it is entitled to an equitable adjustment. Accordingly, this sub-claim is denied.

2-1 Insufficient Specificity of Incoming Waveform for PRF Counter Design

11-35. This sub-claim involved the following specification:

> 3.6.16.4 PRF-jack. When a signal is present on the front panel PRF-jack, the PRF of the incoming signal shall be measured. . . . The counter accuracy shall be ± 1 count or ± 0.01 percent, whichever is greater. . . .

(R4, tab 27 at 002667)

11-36. NavCom designed a universal counter that counted only pulses that were periodic, or which occurred at fixed time intervals. NavCom contends that the Government never specified that the counter should be designed to count non-uniform pulses, or pulses that were not periodic. (Claim at 471-72; tr. 14/91) During FAIPT, the Government required NavCom to measure pulses that were not periodic (Claim at 472; tr. 14/91-92). NavCom was unable to meet the accuracy requirement of the specification because its universal counter was designed to count only periodic pulses. The Government relaxed the specification to indicate a new tolerance of ± 50 counts for the non-uniform pulses. NavCom contended that the Government had, in effect, acknowledged that the specification was defective. (Claim at 473; tr. 14/92-93)

11-37. The specification did not limit the RTS's performance capability to count periodic pulses only. NavCom designed a universal counter which could not meet the measurement accuracy requirement for non-uniform pulses. We find the Government agreed to relax the specification to accommodate the limitation of NavCom's design. (ASR4, tab 739 at 003488-90) There is no merit to this sub-claim. Accordingly, it is denied.

2-2 Unstated Requirement for Remote Verification of Emergency and I/P Operation of RT-1284, RT-1285, RT-1286, RT-1296, and RT-1426/APX-100

11-38. Paragraph 3.6.19.2.2.6 of MIL-T-24664(EC) related to testing of the receiver-transmitter (RT) units. It provided, in relevant part:

> 3.6.19.2.2.6 Performance of RT-1284, RT-1285, RT-1286, RT-1296 and RT-1426/APX-100 transponder tests. . . .
>
> . . . .
>
> f. Verify proper emergency and I/P operation.
>
> . . . .
>
> ii. Verify remote I/P enable in operation.

jj. Verify remote Emergency enable in operation.

(R4, tab 27 at 002682-83)

11-39. NavCom contended that in ¶ 3.6.19.2.2.6ii and jj, the Government explicitly required that the auto tests be performed remotely but in ¶ 3.6.19.2.2.6f, the Government did not explicitly state that the auto test be performed remotely. According to NavCom, during a meeting held on 20 September 1989, the Government requested that wherever possible, NavCom program the test set only to perform the test remotely. Since NavCom flow-charted the auto test routine to perform the tests manually and remotely, it had to change the test procedure to eliminate the unwanted step. (Claim at 473-75)

11-40. The Government's TAR stated that "when a function is done by either a remote input or a front panel switch, the obvious choice for automatic testing is the remote input." The TAR also stated "NavCom had an extra step in the first draft of the flow chart and the Government identified that to them as soon as we were informed. There was no impact on the software development or hardware since it was identified early." (ASR4, tab 739 at 003490-91)

11-41. This sub-claim has no merit. Even though ¶ 3.6.19.2.2.6f did not use the word "remote," NavCom apparently recognized that the emergency and I/P operation had to be verified remotely when it "flow charted the auto test routine to perform these tests manually and remotely" (Claim at 474). All NavCom had to do, when it was told that the test set should be programmed to perform the test remotely was to "eliminate the unwanted step" (Claim at 475). Accordingly, this sub-claim is denied.

2-3 Unstated Requirement for Distinction Between KIT and On-Line Selection for Mode 4 Test Enable Operation

11-42. Paragraph 3.6.9.2.2 of MIL-T-24664(EC), "Interface cable assembly," provided that "[e]ach UUT shall have a unique interface cable assembly for automatic testing. . . . The tests specified in 3.6.19.2.2.1 through 3.6.19.2.2.7 need not be performed in the order listed. . . ." (R4, tab 27 at 002674) Paragraph 3.6.19.2.2.6ff, required that the auto test "Verify Test enable operation for Modes 1, 2, 3/A, C and 4" (R4, tab 27 at 002683).

11-43. NavCom alleged that these tests could be performed manually by activating a switch on the test set front panel or remotely through a remote connector. NavCom contended that the specification was defective because it did not state explicitly which type of operation was intended. (Claim at 475; tr. 14/94-95) With respect to this issue, the TAR stated "There would not be a need for an Automatic Test to test manually." (ASR4, tab 739 at 003491) Since the specification called for automatic testing, it would be

contradictory for ¶ 3.6.19.2.2.6ff to specify manual testing. We disagree that the specification was defective.

11-44. The Government also required that the auto test verify test enable operation for Modes 1, 2, 3/A, C, and 4, with either the KIT physical hardware or KIT simulator contained in the RTS (tr. 14/96). The KIT simulator could not provide the same stimulus as an actual KIT Mode 4 computer. The simulator was built by NavCom and met the requirement for timing relationship (tr. 14/96-101). The problem was solved with a firmware change (tr. 14/102).

11-45. In response to NavCom's REA dated 19 May 1995, the CO by letter dated 18 February 1997 found entitlement on this issue. The CO, however, could not determine quantum because NavCom's proposal "is not sufficiently detailed for the various sub-issues." (ASR4, tab 669 at ¶ 2.b.)

11-46. We find that one of the two methods that the Government required to verify test enable operation for Modes 1, 2, 3/A, and 4 would not work. As a result, NavCom had to find a way to compensate for the RTS KIT simulation. Accordingly, we find that NavCom is entitled to an equitable adjustment.

2-4 KIT/KIR On-Line Testing

11-47. Paragraphs 3.6.19.2.1.1 and 3.6.19.2.1.2 of MIL-T-24664(EC) required the RTS to handle KIT and KIR (classified encryption devices) interface signals. These devices were not furnished as GFE. (Claim at 476; R4, tab 27 at 002674) NavCom could not "reverse engineer" the interface information because the classified KIT and KIR equipment were not furnished as GFE (Claim at 476-77).

11-48. At a meeting held on 25 September 1989, NavCom advised the Government that a KIT and KIR were required as GFE to perform the tests, and NavCom would request a minimum of one each KIT and KIR as GFE (R4, tab 237 at 008069). According to NavCom, its request for technical interface data went unfulfilled. To comply with the contract requirement, NavCom expended time and effort to investigate and analyze the interface signals between each of the UUTs and the KIR/KIT computer. (Claim at 477)

11-49. Although the Government never provided the GFE, the Government did provide manuals which were classified. According to the Government's TAR, "NavCom made no effort to view the classified documentation that would have given them the answers to all of the interface issues" (ASR4, tab 739 at 003493).

11-50. The testing requirements were ultimately deleted because NavCom "did not attain a COMSEC [Communications Security] account that would allow the Government to provide the controlled assets for testing" (ASR4, tab 739 at 003494).

11-51. Even though the Government never provided the KIT/KIR devices, the Government did provide informally the classified documentation. NavCom offered no rebuttal to the Government's assertion that all of the interface information could have been obtained from the classified documentation provided. We find that NavCom has failed to prove by a preponderance of the evidence that it is entitled to an equitable adjustment. Accordingly this sub-claim is denied.

2-5 Unspecified External Pretrigger Signal Timing and Jitter for the KIT/KIR Simulator

11-52. Paragraphs 3.6.10 and 3.6.12 of MIL-T-24664(EC) required the RTS to provide Mode 4 KIR simulator signals in response to KM selection of either an internal Mode 4 pretrigger output or an external Mode 4 pretrigger input, respectively (Claim at 478-79; R4, tab 27 at 002664, 002666). Paragraph 3.6.10 also required that the timing of the KIR simulator output signals retain its reference to the zero trigger with either Mode 4 pretrigger enable selection (Claim at 479; R4, tab 27 at 002664). Paragraph 3.6.10.4 specified requirements concerning jitter and timing of gain time control (GTC) trigger output, and jitter of pretrigger output (Claim at 479; R4, tab 27 at 002665). Paragraph 3.6.13 specified requirements concerning the pretrigger timing and jitter with respect to the zero trigger (Claim at 479; R4, tab 27 at 002666).

11-53. According to NavCom, when testing was performed with the GFE, it was found that the GFE generated Mode 4 pretrigger exceeding the required 0.5 micro seconds jitter relative to zero trigger. The external Mode 4 pretrigger from the GFE did not meet the same jitter specification as the internal Mode 4 pretrigger, relative to the zero trigger. This made it impossible to meet the jitter specification for the Mode 4 GTC trigger (Claim at 479-80).

11-54. When the Government was advised of the problem, it advised NavCom to use the "external" Mode 4 pretrigger as an enable and reference all timing from the internal Mode 4 pretrigger. This required an extensive change to the challenge modulator generator (CMG) CCA. (Claim at 479-80)

11-55. In response, the Government's TAR stated "[i]f synchronization to the internal signals required NavCom to redesign, it simply means that the original design was inadequate" (ASR4, tab 739 at 003495).

11-56. Neither party further elaborated on this sub-claim at the hearing. We are left with what we have in the unexplained record. Based on what we have, we find that NavCom has failed to prove by a preponderance of the evidence that NavCom is entitled to an equitable adjustment. Accordingly, this sub-claim is denied.

3-1 Incorrect Fault Test Indication for the SN/416A and B/APX-76(V)

11-57. Paragraph 3.6.19.2.2.2.1i of MIL-T-24664(EC) required the RTS to verify the presence of a Mode 4 lockout light return fault indication to a control box (R4, tab 27 at 002677). The GFE interrogator could not produce this condition (tr. 14/103). NavCom investigated the problem and traced it to the GFE. The GFE "could not, would not produce this condition in any shape, manner, or form." (Claim at 481; tr. 14/103)

11-58. The problem was resolved by Modification No. P00022, in which the Government deleted the requirement (R4, tab 26 at Attachment (14)). The Government's TAR acknowledged the requirement was "in error" (ASR4, tab 739 at 003496). In response to NavCom's 19 May 1995 REA, the CO found entitlement on this issue but was unable to determine quantum (ASR4, tab 669).

11-59. To the extent NavCom is entitled to an equitable adjustment, we find bilateral Modification No. P00022 released the Government. Accordingly, this sub-claim is denied.

3-2 Incorrect Self-Test and Fault Indication Procedure for the SA-1568A/APX-76(V) Auto Test

11-60. Paragraph 3.6.19.2.2.2.3h. of MIL-T-24664(EC) required the auto test to verify the basic operation of the self-test and fault indication of the SA-1568A switch amplifier. The switch amplifier could not perform this function. (Claim at 481; R4, tab 27 at 2678; tr. 14/104). A control line required to generate a response was missing from the GFE (tr. 14/105).

11-61. According to NavCom, it underwent "extensive analysis and test, troubleshoot, of the integrated system with the GFE to determine the cause of the problem through multiple experimentation" (tr. 14/105-06). NavCom finally concluded that the specification requirement could not be performed and informed the Government. The Government deleted the test requirement in Modification No. P00022 (tr. 14/106; R4, tab 26 at 002512). In response to NavCom's 19 May 1995 REA, the CO found entitlement on this issue but was unable to determine quantum (ASR4, tab 669).

11-62. To the extent NavCom is entitled to an equitable adjustment, we find bilateral Modification No. P00022 released the Government. Accordingly, this sub-claim is denied.

3-3 Incorrect Switched Output Voltage for RT-1063B/APX-101 Transponder Auto Test

11-63. Paragraph 3.6.19.2.2.7 required the auto test to verify switched primary power output. In Paragraph 3.6.19.2.2.7r., the specification required the auto test to verify a switched 28 VDC output. In Paragraph 3.6.19.2.2.7s., the specification required the auto test to verify a switched 115 VAC output. (R4, tab 27 at 002683) NavCom requested clarification at a meeting held on 25 September 1989 (R4, tab 237 at 008071).

11-64. NavCom claimed that the Government did not respond (Claim at 487). The Government claimed that it contacted the Air Force equipment specialist who contacted NavCom directly to discuss the problem, and later notified the procuring agency that subparagraph r. (28 VDC) should be deleted (ASR4, tab 739 at 003504).

11-65. NavCom designed the test to input 115 VAC and to verify switched 115 VAC output pursuant to subparagraph s. (Claim at 487). The Government deleted subparagraph r. by Modification No. P00022 (R4, tab 26 at Attachment (14)).

11-66. We find NavCom designed the test to input 115 VAC as a result of input received from the Air Force equipment specialist. Other than noticing the disparity, there is no evidence that NavCom expended time and effort on the problem. We find no basis for an equitable adjustment. Moreover, even if NavCom is entitled to an equitable adjustment, we find bilateral Modification No. P00022 released the Government. Accordingly, this sub-claim is denied.

3-4 Unstated Requirement for Stretched Video for Mode 4 Reply

11-67. Paragraph 3.6.11.3 of MIL-T-24664(EC) required that the RTS generate a Mode 4 reply for each enable trigger input logically "ANDed" with a transponder Mode 4 P4 pulse (R4, tab 27 at 002665). The 149 Contract had the same requirement at ¶ 3.7.12.3 (R4, tab 2 at 142).

11-68. NavCom alleged that the RTS design that was approved under the 149 Contract did not generate the required Mode 4 reply unless the incoming challenge signal was "coincident" with the enable trigger (Claim at 488).

11-69. The GFE involved in this sub-claim was an APX-64. The APX-64 enable trigger and challenge pulses were not coincident. (R4, tab 227 at 007898) NavCom contended that it could only meet the auto test requirement by changing the circuitry on the challenge modulator generator (CMG) printed circuit board (PCB) to stretch the incoming challenge signal by 300 nanoseconds to ensure that it would be coincident with the enable trigger (Claim at 489).

11-70. The Government's TAR contended that stretching the incoming challenge video by 300 nanoseconds was an internal delay adjustment, and NavCom had to make this adjustment in the 155 RTS because the 149 EDM was not properly designed. (ASR4, tab 739 at 003504-3506).

11-71. Neither party further elaborated on this sub-claim at the hearing. We are left with what we have in the unexplained record. Based on what we have in the record, we find that NavCom has failed to prove by a preponderance of the evidence that it is entitled to an equitable adjustment. Accordingly, this sub-claim is denied.

3-5 Conflicting Requirements for Display of SIF Reply

11-72. Paragraph 3.6.19.2.2.6e. of MIL-T-24664(EC) required that the RTS "[d]ecode, and store for later display, Modes 1, 2, and 3/A reply codes" (R4, tab 27 at 002682). Paragraph 3.6.19.2.2.6kk. required that "[u]pon completion, display any failed tests and the values measured for: '. . . 3. Mode 2 code . . . .'" (R4, tab 27 at 002683)

11-73. NavCom apparently recognized the inconsistency. Dooley's log of 21 September 1989 contained this note:

> STEP E CALLS TO STORE FOR LATER DISPLAY MODE 1, 2 AND 3/A CODES, YET STEP kk CALLS FOR DISPLAY OF MODE 2 CODE ONLY. IT IS ASSUME[D] THAT STEP kk IS IN ERROR AND ALL THREE CODES SHALL BE DISPLAYED OVERSITE [sic].

The Government acknowledged that the inconsistency was an oversight (R4, tab 244 at 008094). We find that NavCom was never misled into believing that only Mode 2 code had to be displayed.

11-74. NavCom claimed that in order to perform the Government's intended storage and display functions, it had to add firmware to the ACM and prepare appropriate test procedure (Claim at 490).

11-75. In response to NavCom's 19 May 1995 REA, the CO found entitlement on this sub-claim but was unable to determine quantum (ASR4, tab 669).

11-76. Reading the two paragraphs together, the conclusion is inescapable that Modes 1, 2, and 3/A all had to be displayed. We have found that NavCom was never misled into believing that only Mode 2 code had to be displayed. Therefore, notwithstanding the CO's determination, we find no basis for an equitable adjustment. Accordingly, this sub-claim is denied.

3-6 Insufficient Specificity of Test-Go and BIT-Go Indications for RT-1157/APX-100 Transponder Auto Test

11-77. Paragraph 3.6.19.2.2.5 required the RTS to:

> ee. Verify Test-Go indication.
>
> . . . .
>
> kk. Verify BIT Go output.
>
> . . . .
>
> qq. Verify Test-Go indication.

(R4, tab 27 at 002681)

11-78. The technical manuals for the RT-1157/APX-100 had conflicting information concerning these signals. The operator manual indicated only one Test-Go signal and two BIT-Go signals. The intermediate maintenance manual indicated two Test-Go signals and one BIT-Go signal. (Claim at 491)

11-79. The Government's TAR stated:

> When NavCom found the discrepancies, the Government attempted to obtain the schematics for the equipment . . . This documentation was unavailable from the Government depot and the manufacturer was reluctant to release the drawings. The only data that could be provided was reverse engineered schematics that could not be verified to contain all Engineering Changes to the equipment. . . .

(ASR4, tab 739 at 003508)

11-80. NavCom claimed that after "a lengthy, non-availing investigation," it arbitrarily decided to test the interfaces located on the GFE at J1-23 and J1-75, and by coincidence, these were the signals the Government had intended for the RTS to verify (Claim at 492). The TAR stated that "NavCom selected the correct signals and responses to those inputs . . . indicated that the problem was not as serious as they had indicated. Obviously, they found the needed information prior to designing the hardware and firmware for the ACM" (ASR4, tab 739 at 003508). NavCom contended that the Government's

ratification of its arbitrary selection did not compensate it for the additional work, or for the delay and disruption caused by the deficient specification (Claim 492).

11-81. In response to NavCom's 19 May 1995 REA, the CO found entitlement on this issue but was unable to determine quantum (ASR4, tab 669). We agree with the CO's determination that NavCom is entitled to an equitable adjustment for the effort it expended to ascertain the signals the Government wanted it to verify.

3-7 Insufficient Specificity of Test Go and BIT Go Signals for RT-1063B/APX-101 Transponder Auto Tests

11-82. Paragraph 3.6.19.2.2.7 of MIL-T-24664(EC) required the RTS to:

aa. Verify Test-Go indication.

. . . .

ff. Verify BIT Go output.

(R4, tab 27 at 002684)

11-83. The technical manual for the RT-1063B/APX-101 transponder did not list the signals to be tested (Claim at 493). According to the Government's TAR, the procuring agency (Navy) did not use the transponder and asked the Air Force to review the specification for clarification of the requirement. The Air Force indicated that it saw no problem with the requirement as written. To be certain, the Government ordered another set of manuals for the APX-101. Before receiving the manuals, the problem was resolved and the order was canceled. (ASR4, tab 739 at 003508-3509)

11-84. NavCom alleged that it had to perform a "lengthy, non-availing investigation" and finally "arbitrarily selected the signal located on J1-13 for verification of BIT test go status." NavCom's arbitrary selection was acceptable to the Government. It claimed for "the additional work, and for the delay and disruption caused by the deficient specification." (Claim at 492-93)

11-85. In response to NavCom's 19 May 1995 REA, the CO found entitlement on this issue but was unable to determine quantum (ASR4, tab 669). We agree with the CO's determination that NavCom is entitled to an equitable adjustment for the effort it expended to ascertain the signals the Government wanted it to verify.

4-1 Unstated Source Impedance for Protective Circuit Design

11-86. Paragraphs 3.6.19.2.1.1.1 and 3.6.19.2.1.2.1 of MIL-T-24664(EC) required that all interfaces withstand signals up to ± 30 VDC levels (R4, tab 27 at 002674). The specification did not contain the "source impedance" of the ± 30 VDC signal (Claim at 493-94). NavCom alleged that the input protection circuit design could not be finalized until the source impedance of the ± 30 VDC signal was verified (Claim at 494). NavCom alleged that it requested the source impedance from the Government in a letter dated 4 August 1989 (R4, tab 247).

11-87. The Government's TAR stated that the specification required that the circuits be projected to withstand any signal that could be provided by an on-line piece of equipment. The TAR stated that NavCom had argued that it could not economically provide this level of protection and had assumed the source impedance would be that of an operational equipment of around 1,000 ohms. The TAR contended that NavCom actually used its letter of inquiry to seek confirmation that it could offer less protection that the specification demanded. (ASR4, tab 739 at 003509-10)

11-88. In response to NavCom's 4 August 1989 letter, the Government's 26 October 1989 letter stated that "this command has determined that for the purpose of input circuit protection any signal of up to ± 30 VDC applied to the interface will have an output impedance of at least 1000 ohms." The Government's letter went on to say:

> This letter does not authorize a change in the scope or price of the contract. If the contractor does not agree with this determination, he shall take no action pursuant to this letter and shall immediately notify the procurement contracting officer. Lack of such notification will be construed to mean that the contractor agrees that no changes to the contract are implied.

(R4, tab 247) NavCom did not notify the Government that it considered the requirement of at least 1,000 ohms of output impedance to be a change to the contract requirement. Nor is there evidence that NavCom's design of the input protection circuit design was delayed.

11-89. Weighing the evidence before us, we find the Government's version more credible. NavCom was required to design the RTS such that all interfaces could withstand signals up to ± 30 VDC. NavCom offered protection of "an operational equipment" which would require a source impedance of around 1,000 ohms rather than protection from any signal from on-line equipment (ASR4, tab 739 at 003510). The Government found that to be acceptable. There is no basis for an equitable adjustment. Accordingly, this sub-claim is denied.

4-2 Unstated requirement for Operator Prompt to Select Long or Short for GTC Operation for AN/UPX-23 or AN/UPX-27 Interrogator Auto Tests

11-90. Paragraphs 3.6.19.2.2.1v. and y. of MIL-T-24664(EC) required that the RTS auto test verify proper "GTC" operation and establish the minimum decoded signal (MDS) sensitivity on the composite video within ± 1 dB respectively (R4, tab 27 at 002676). These requirements did not account for the fact that the GFE had two GTC modes of operation, long and short, one of which had to be selected before accessing the appropriate auto test step (Claim at 494).

11-91. NavCom designed the ACM based on the GFE technical manuals, which indicated there was in the GFE a remote input line that could be used to select a long or short mode of operation (Claim at 495). The GFE, however, did not have the remote input line due to a change of the equipment which was not reflected in the manuals. To account for the missing remote input line, NavCom had to remove the hardware control from the ACM and associated cable and to modify software to prompt the selection of the long or short mode (Claim at 495).

11-92. NavCom contends that the Government had also adjusted the remote receiver gain in the GFE, and did not document this adjustment in the Government-furnished information (GFI) provided to NavCom. This adjustment allegedly affected the overall system sensitivity and ability to meet the specification. (Claim at 496)

11-93. The Government's TAR acknowledged that the remote selection of the long and short form GTC had been deleted by an engineering change to the equipment. The TAR asserted that NavCom was given the "current technical manual and all of the change pages. But it was later discovered that the change pages had not been placed in the technical manual that NavCom had in [its] possession." (R4, tab 739 at 003511) The TAR also asserted that the change pages that reflected the equipment configuration of the remote receiver gain were furnished but had been separated from the GFI (R4, tab 739 at 003512).

11-94. Neither party addressed this claim at the hearing. NavCom has not responded to the Government's assertion that NavCom had the changes to the GFI but did not properly file them. We find that NavCom has not proved by a preponderance of the evidence that the GFI furnished was incomplete. Accordingly, this sub-claim is denied.

4-3 Need for Video Gate to Circumvent GFE Bleed Through (T/R Isolation)

11-95. Paragraph 3.6.19.2.2.1p. required that the auto test "[v]erify reply video at composite A and B outputs of 2.0 ± 0.5 volts across 75 ohms" (R4, tab 27 at 002675). The GFE exhibited poor isolation from its high power transmitter to its low level video lines

and caused the transmitter signals to appear on the video lines. As a result, the video amplitudes could not be verified. (Claim at 496)

11-96. To correct the problem, transmitter signals had to be gated off during transmission and gated on during reply in order for the video amplitudes to be verified (R4, tab 227 at 007849, 007852-53, 007856). NavCom allegedly had to add hardware and software control to the RTS in order to perform the gating function (Claim at 496-97).

11-97. The Government's TAR stated that the 155 specification "required the measurement module to be capable of being gated to a single pulse for several of the measurements." While this was not the case for the 149 Contract, the Government asserted that NavCom had been briefed and was aware of the requirement. The TAR contended that NavCom's design rather than the GFE was the source of the problem. (R4, tab 739 at 003513)

11-98. Neither party further elaborated on this issue at the hearing. NavCom did not address the Government contention that the design rather than GFE was the problem. Based on what we have in the record, we cannot conclude that the GFE was deficient or that NavCom's RTS design did not contribute to the poor isolation in the video. We find no basis for an equitable adjustment. Accordingly, this sub-claim is denied.

4-4[22] Interconnect CCA

11-99. NavCom alleged that the GFE isolation between the transmitter output and the low level video lines was poor, in particular for the AN/UPX-23 and the AN/UPX-27, causing "bleedthrough." The "bleedthrough" was resolved by the addition of a circuit trace to the interconnect digital motherboard to reroute the artwork to provide a video gate signal from the RPG to the measurement module. (Claim at 497)

11-100. The Government's TAR asserted that the gating function was required by the specification, and not because the GFE was a problem. The Government asserted that the isolation experienced could be in the ACM or the RTS and created by not allowing enough signal isolation between the RF and video paths. NavCom did not address the Government's assertions.

11-101. Based on what we have in the record, we cannot conclude that the "bleedthrough" was caused by the GFE. We find that NavCom has not proved by a preponderance of the evidence that it is entitled to an equitable adjustment. Accordingly, this sub-claim is denied.

4-5 GFE Pulse Fidelity

11-102. Paragraph 3.6.19.2.2.1v. required that the auto test verify proper GTC operation (R4, tab 27 at 002676). NavCom alleged that the voltage amplitude could not be measured because the GFE produced video pulse of poor fidelity. To address this problem, NavCom alleged that the pulse measurement algorithms had to be rewritten. (Claim at 497)

11-103. The Government's TAR asserted that the same test was required under the R&D contract and NavCom successfully made measurements before. The Government contends that the problem was caused by NavCom's redesigning the RF portion of the RTS. The Government asserted that it had to help NavCom to write a reasonable algorithm for testing the GTC because NavCom lacked ability to do so and not because of a problem with the GFE (ASR4, tab 739 at 003514).

11-104. Neither party further elaborated on this issue at the hearing. We are thus left with what we have in the unexplained record. Based on what we have, we cannot conclude that the GFE was defective. We therefore find no basis for an equitable adjustment. Accordingly, this sub-claim is denied.

4-6 RT-1157/APX-100 M4 Reply Test Light

11-105. Paragraph 3.6.19.2.2.5x. required the auto test to "[v]erify both reply light enable signals." Paragraph 3.6.19.2.2.5mm. required the auto test to "[v]erify Mode 4 reply light disable operation." (R4, tab 27 at 002681) According to NavCom, the Mode 4 reply light test signal did not initially respond to the Mode 4 reply light function test. After the Government furnished NavCom with schematics for the GFE in January 1990, NavCom determined that a pull-up resistor had to be connected to the ACM in order to stimulate the proper response. (Claim at 498)

11-106. Paragraph 3.6.19.2.2.5v., ii., and qq., required that the auto test verify standby operation, the Test Monitor No-Go signal, and the Test Go indication, respectively (R4, tab 27 at 002681). NavCom designed the ACM with 5.0 V output, allegedly the typical logic signals. When NavCom tested the GFE, it discovered that the actual signal was 28 V. As a result, NavCom had to redesign the ACM to measure 28 V. (Claim at 498)

11-107. Neither parties elaborated on the issues during the hearing. With respect to ¶¶ 3.6.19.2.2.5 x. and mm., the Government ultimately provided the schematics, and NavCom was able to stimulate the proper response. With respect to ¶¶ 3.6.19.2.2.5v., ii., and qq., the Government's TAR stated:

> NavCom knew that the units were actuated by a set switches directly to ground and that the power source was 28 volts. They simply designed the units to standard TTL logic first and then

> provided the required levels to the UUT from there. This allows a more universal design to the ACM and the differences are primarily kept in the interface of signals to the specific unit under test.

(ASR4, tab 739 at 003515)

11-108. The Government provided the GFE and the schematics. NavCom has not addressed the Government's defense. Based on what we have in the record, we are unable to find that NavCom is entitled to an equitable adjustment. Accordingly, this sub-claim is denied.

4-7 RT( )/APX-100 Test Monitor No/Go & Test Go (5V vs 28V)

11-109. Paragraphs 3.6.19.2.2.6bb., and ee., required the auto test to verify the remote Test-Go indication and remote Test Monitor No-Go signal, respectively (R4, tab 27 at 002682-83). NavCom alleged that, in the absence of GFI, it assumed the signal output for the GFE to be 5.0 V. When NavCom tested the GFE, it discovered that the actual signal was 28 V. As a result, NavCom had to add a voltage divider to the ACM to measure 28 V, which included the addition of 2 transistors and several resistors. (Claim at 499)

11-110. The Government's TAR alleged that NavCom had the technical documentation prior to submitting its proposal. The Government contends that "[w]ith only 28 volts as a power source, and all control lines going directly to the ground, any assumption that 5 volt logic levels were in use was ridiculous." (ASR4 tab 739 at 003515)

11-111. Neither party further elaborated on this issue at the hearing. NavCom has not addressed the Government's position in the TAR. On the basis of what we have in the record, we find that NavCom has not proven by a preponderance of the evidence that it is entitled to an equitable adjustment. Accordingly, this sub-claim is denied.

4-8 APX-76 Challenge/Reply, Challenge Video & Zero Trigger

11-112. NavCom alleged that because the technical manuals did not provide otherwise, it designed logic control lines, such as the Challenge Reply, Challenge Video, and Zero Trigger signals of the APX-76 on the basis of TTL. When NavCom tested the GFE, it discovered that the signals were loaded with 91 ohms because it had unexpected "video" interfaces, instead of the "digital" interface assumed. As a result, NavCom had to buffer the signals. (Claim at 499)

11-113. According to the Government's TAR, NavCom had no basis for assuming TTL logic for control lines because "none of the GFE uses the TTL levels for control." According to the Government, NavCom had "a technical document that did not state otherwise, they had all of the other GFE documents that showed the signal levels were not TTL." (ASR4, tab 739 at 003516)

11-114. Neither party further elaborated on this issue at the hearing. NavCom has not addressed the Government's position in the TAR. On the basis of what we have in the record, we find that NavCom has failed to prove by a preponderance of the evidence that it is entitled to an equitable adjustment. Accordingly, this sub-claim is denied.

4-9 APX-76 Long Range Display & Test Challenge (5V Vs 15V)

11-115. NavCom alleged that it assumed Long Range and Test Challenge signals were 5.0 V. When NavCom tested the GFE, it discovered that the signals were 0 to 15 V. As a result, NavCom had to redesign the ACM to accommodate the actual voltage requirements, which included the addition of three transistors and several resistors. (Claim at 499)

11-116. The Government's TAR made the point that there was no basis for NavCom to assume that Long Range and Test Challenge signals were 5.0 V (ASR4, tab 739 at 003516).

11-117. Neither party further elaborated on this issue at the hearing. We are left with what is in the unexplained record. On the basis of what we have, we find that NavCom has failed to prove by a preponderance of the evidence that it is entitled to an equitable adjustment. Accordingly, this sub-claim is denied.

4-10 APX-76 Receiver Video Rise and Fall Times

11-118. NavCom alleged that the technical manual did not specify the rise and fall times of the receiver video signal for the GFE (Claim at 499). When NavCom tested the GFE, it discovered that the rise and fall times for this signal were less than 50 nanoseconds. As a result, NavCom had to change the circuitry in the ACM to measure this faster than expected rise and fall time. (ASR4, tab 739 at 500)

11-119. In response, the Government's TAR stated "NavCom did not have to measure the rise and fall of the video. They only had to route the video to the measurement module for amplitude measurements." (ASR4, tab 739 at 003516)

11-120. Neither party further elaborated on this issue at the hearing. Based on what we have in the unexplained record, we find that NavCom has failed to prove by a

preponderance of the evidence that it is entitled to an equitable adjustment. Accordingly, this sub-claim is denied.

4-11 KY-532/533 Connector Specification

11-121. NavCom alleged that, according to the GFE manual, the KY-532A had a 126-10572 pin connector. However, the KY-532B actually received by NavCom had a 50 pin "D" connector. NavCom alleged that it had to modify the ACM design, make changes to the documentation, and reorder materials in order to compensate for the discrepancy. (Claim at 500)

11-122. The TAR acknowledged that NavCom is entitled to an equitable adjustment. In response to NavCom's 19 May 1995 REA, the CO found entitlement on this issue but was unable to determine quantum. (ASR4, tab 669) The TAR cautioned that if NavCom were able simply to exchange the wrong connector for the right one, the Government should receive credit for the connector not delivered. We agree with the CO that NavCom is entitled to the reasonable cost of modifying the ACM design and additional cost incurred for the 50 pin "D" connector.

DECISION

GFE INTERFACE SPECIFICATION DEFECTS (Claim No. 11)

We summarize our findings of entitlement in the following table:

Sub-claim No.	Entitlement[23]	Spec. Modified By P00022
1-1	Denied	Yes
1-2	Denied	Yes
1-3	Denied	No
1-4	Denied	No
1-5	Denied	No
1-6	Denied	No
1-7	Denied	No
2-1	Denied	No
2-2	Denied	No
2-3	Granted	No
2-4	Denied	No
2-5	Denied	No
3-1	Denied	Yes
3-2	Denied	Yes
3-3	Denied	Yes
3-4	Denied	No

3-5	Denied	No
3-6	Granted	No
3-7	Granted	No
4-1	Denied	No
4-2	Denied	No
4-3	Denied	No
4-4	Denied	No
4-5	Denied	No
4-6	Denied	No
4-7	Denied	No
4-8	Denied	No
4-9	Denied	No
4-10	Denied	No
4-11	Granted	No

Where a contractor has failed to prove specifically how unsuitable GFP caused its injuries, its claim for equitable adjustment has been denied. *See, e.g., Tayag Bros. Enterprises, Inc.,* ASBCA No. 42097, 94-3 BCA ¶ 26,962 (contractor has the burden of proving discrepancies in fire alarm system were caused by defects in the GFM); *Fairfield Machine Co.,* ASBCA No. 22704, 85-2 BCA ¶ 17,696 (GFP not shown to affect contractor's performance).

Of the 30 sub-claims under Claim No. 11 brought as a part of NavCom's 1995 REA, the CO found entitlement in seven sub-claims (2-3, 3-1, 3-2, 3-5, 3-6, 3-7, and 4-11). We have reviewed the same 30 sub-claims. We agree with the CO's determination in four of the sub-claims (2-3, 3-6, 3-7, and 4-11). We reach a contrary decision with respect to sub-claims 3-1, 3-2, and 3-5. *See Wilner v. United States*, 24 F.3d 1397, 1402 (Fed. Cir 1994) (*en banc*) ("once an action is brought following a contracting officer's decision, the parties start in court or before the board with a clean slate"). We denied either for lack of merit or lack of proof the remaining 26 sub-claims.

CONCLUSION

For reasons heretofore set forth, we hold that, subject to proof of quantum, NavCom is entitled to an equitable adjustment for sub-claims 2-3, 3-6, 3-7 and 4-11. NavCom's appeal in the remaining 26 sub-claims is denied.

Claim No. 11 - Quantum

FINDINGS OF FACT

11-123. In defense of NavCom's quantum case, the Government called as its expert Professor Paul J. Kauffmann. In addition to his Bachelor's Degree in Electrical Engineering and his Master's Degree in Mechanical Engineering, Professor Kauffmann received his Ph. D. in Industrial Engineering from Pennsylvania State University. (Ex. G-5000) At the time the hearing took place, Professor Kauffmann was an Assistant Professor in the Department of Engineering Management at Old Dominion University, Norfolk, Virginia (tr. 1/18). He is a licensed professional engineer in Virginia (tr. 1/41). For the 15 years prior to his appearance at the hearing, Professor Kauffmann had been involved with engineering management, project management, cost and budget issues (tr. 1/20-21). He had been the Director of Machine Design Engineering for a major corporation, and a plant manager. He has written extensively, and has been a consultant to a number of large corporations and a Government agency. He was received by the Board as an expert in the areas of engineering, engineering management and cost estimating (tr. 6/6).

11-124. At the Government's request, Professor Kauffmann prepared an analysis of NavCom's claim (ex. G-5003). His analysis focused on three areas:

> . . . The first was to determine what I call the baseline of what NavCom planned to do, how they estimated that cost and how that led into the proposal. [Secondly] I tried to track or identify any changes from that baseline and how they were documented and justified and what the cost impact was.
>
> And then thirdly, I looked for specific details of descriptions of technical activities that were tied directly to some sort of [NavCom's claim] cost estimate.

(Tr. 6/7)

11-125. As a part of its proposal, NavCom described a project management system it planned to use on the 155 Contract. Among other capabilities, this project management system would have enabled NavCom to: (1) define work packages that were associated with the project work breakdown structure (WBS) to include cost, schedule, manpower and statement of work; (2) use a cost allocation system that would provide comparison of actual cost of work performed (ACWP), budgeted cost of work performed (BCWP), actual cost of work scheduled (ACWS), and budgeted cost of work scheduled (BCWS); (3) continuously match costs with plans for each task; and (4) measure job performance at the functional level, the WBS work package level, and the cost account level. (R4, tab 17 at 001271-75; ex. G-5003 at 20-21). According to Professor Kauffmann, "[t]his system,

promised by NavCom, should have provided management data to control the UPM - 155 project and the supporting information to evaluate the cost issues in the claim. . . . It should also have been the basis to document the alleged out of scope work and costs in the REA" (ex. 5003 at 21).

11-126. In reviewing NavCom's claim, Professor Kauffmann found numerous indications that NavCom did not implement its proposed project management system. For example, NavCom's claim asserts that it did not recognize that it was incurring substantially more non-recurring cost than anticipated until late 1989, 8 to 10 months into the project. Had NavCom implemented a detailed WBS that defined measurable results, NavCom would have been able to identify out-of-scope work instantly. (Ex. G-5003 at 21; Claim at 2, 39). NavCom's claim also asserts that "it was not possible to determine directly from NavCom's cost ledger how much of the cost growth was in-scope or out-out-scope [sic]" (Claim at 8). Had NavCom implemented the project management system, it would have been possible for NavCom to identify in and out of scope work (ex. G-5003 at 21). Professor Kauffmann's review of NavCom engineering managers' weekly and monthly reports, pertinent deposition transcripts, and NavCom's documents reinforced his conclusion that NavCom did not implement the project management system proposed (ex. G-5003 at 21-22). NavCom gave no explanation for its failure to do so.

11-127. With respect to NavCom's project management and cost tracking ability during the course of performance, Professor Kauffmann summarized his findings as follows:

- NavCom's project management problems began with the proposal estimate. Documents used by NavCom to prepare the project cost proposal do not contain detailed estimates and descriptions of the work to be performed. In addition, they seldom reference the contractual technical specifications of the Navy RFP. As a result, the estimates NavCom used to develop the proposal could not have been accurate.

- Although NavCom proposed a project management system, one was not implemented and used. As a result, it is impossible for NavCom to document the in and out of scope portions that are alleged in the REA. NavCom's proposal cost estimates also do not provide sufficient detail to identify in and out of scope work and costs.

- NavCom's WBS does not provide enough discrete elements to control cost and progress. Consequently, it was

> impossible for NavCom management to accurately know project completion and cost status.

(Ex. G-5003 at 24-25)

11-128. Without a detailed baseline estimate to identify in and out of scope work, and without implementing its project management system to track costs, NavCom was forced to devise a complex cost allocation structure to estimate its claim. Among the cost allocation methods NavCom used were: (1) Primary Period Out of Scope Method; (2) Discrete Out of Scope Method; (3) Discrete Employee Charge Method; (4) Rework Instruction Ratio Method; (5) Support Reallocation Method - Manufacturing/QA (Quality Assurance) Support and PMO (Program Management Office) Labor; (6) FAIPT (First Article Inspection Performance Test) Method; (7) Quality Test Action Ratio Method; and (8) Software/Documentation Method. (Claim at 35-57; ex. G-5003 at 26-44) NavCom selected from this menu what in its view were the appropriate combination of allocation methods to estimate the damages of its various claims.

11-129. Nor did NavCom issue charge numbers to keep track of out-of-scope work. William Snyder, NavCom's project manager gave the following explanation:

> If the people doing the work can't identify if it's in scope or out of scope or if they're working on this or that, then you put them in jeopardy of mischarging by having an intricate charge number system that they can't relate to the work . . . they're doing.
>
> . . . .
>
> The other thing was we were working seven days a week to get this thing in production, and my job wasn't to be an administrator. My job . . . was the trail boss. I was in there whipping the cows down a path of first article. I didn't have a lot of time or patience for dealing with a detailed charge number.

(Tr. 4/92) Although NavCom was able to develop a cost tracking system to substantiate the cost impact by direct and specific proof, we find that it chose not to do so.

11-130. As demonstrated by the outcome of many of the claims we have decided so far, we find the "concern" or the confusion with respect to what was in-scope work and what was out-of-scope work was attributable mainly to Van Cleave's (and hence NavCom management's) misguided perception that the requirements of the 155 Contract were determined by the R&D results of the 149 Contract.

11-131. In Claim No. 11, NavCom alleges that the Government incorrectly specified interface data and this resulted in 29 errors[24] that required engineering effort to resolve. Of the 29 alleged errors, NavCom alleges that 22 impacted the ACMs and 7 impacted the RTS. (Ex. G-5003 at 97; Claim at 500) Of the four sub-claims for which we found entitlement, sub-claims 2-3 and 4-11 affected the ACM design, and sub-claims 3-6 and 3-7 affected the RTS design (Claim at 500, n. 233).

11-132. NavCom used a combination of the (1) Primary Period Out of Scope Method, (2) Rework Instruction Ratio Method and (3) Support Reallocation Method in arriving at its $825,457 claim for Claim No. 11 (Claim at 501-502, 525). If NavCom prevailed on some but not all of the sub-claims, it has provided us no acceptable means for determining a fair and reasonable approximation of the damages suffered on the individual sub-claims.

11-133. Under the Primary Period Out of Scope Method, NavCom first examined its engineering managers' reports to find any references to an issue of interest. The time period during which references were found was considered the out-of-scope period. NavCom then examined the time sheets and identified the PCNs (Project Charge Numbers) that received charges during the out-of-scope period. The hours charged were considered out-of-scope hours. NavCom allocated the out-of-scope hours to the claim at a percentage it considered appropriate. According to Professor Kauffmann, "[i]n over 75% of alleged out of scope time periods, NavCom alleges 100% of the costs are out of scope." NavCom also used the alleged out-of-scope period costs to derive out-of-scope support costs. (Ex. G-5003 at 26)

11-134. According to Professor Kauffmann, this method raised several concerns. One concern was that NavCom assumed that the work of all of the engineers within a group during the out-of-scope period was out-of-scope work. The other concern was that the method assumed all originally planned hours for the work had been expended. Professor Kauffmann opined that "[t]he cumulative impact of these concerns is an overstatement of out of scope claims." (Ex. G-5003 at 27-29)

11-135. NavCom also used the Rework Instruction Ratio Method to establish the out-of-scope costs for Claim No. 11. A Rework Instruction (RI) is an internal NavCom document that provides instructions to update existing (fabricated) units. NavCom used this method to identify the out-of-scope costs for "drawing clean up activit[ies]" associated with first article redesign (PCN 1194) and reliability prediction (PCN 8251). A portion of the costs of PCN 1194 were allocated to Claim Nos. 1, 3, 4, 5, 7, 8 and 11. A portion of the costs of PCN 8251 were allocated to Claim No. 11. (Ex. G-5003 at 30)

11-136. NavCom's Rework Instruction Ratio Method used a ratio of alleged in- and out-of-scope rework instructions. NavCom claims that 245 RIs were developed during the

redesign associated with first article tests and it classifies 142 of them as out-of-scope (142/245=57%). Using this calculation, NavCom alleges that 57% of the costs collected in PCN 1194 and PCN 8251 are out-of-scope. Because 19 out of the 142 out-of-scope RIs are allegedly involved in Claim No. 11, the percentage of PCN 1194 costs allocated to the claim is 13.4%. (Ex. G-5003 at 31)

11-137. According to Professor Kauffmann, NavCom has not explained the methodology for selecting the out-of-scope RIs and has not established a relationship between the RI activities and out-of scope first article tests. Consequently, there is no assurance that the RIs did not result from NavCom initiated changes such as its own cost-cutting activities, continuing in-scope design, or design error correction. (Ex. G-5003 at 32)

11-138. Also in connection with Claim No. 11, NavCom alleges that it had to recalculate reliability prediction twice. The first recalculation is alleged to have resulted from design changes necessitated by defective interface specifications. This work allegely took place between February and July 1990. The second reliability prediction recalculation is alleged to have resulted from design changes reflected by the RIs and the first article redesign. NavCom claims this occurred from February to October 1993 and claims 57% of the PCN 8251 costs. (Ex. G-5003 at 31)

11-139. Professor Kauffmann observed that NavCom has not explained that its out-of-scope reliability prediction costs (PCN 8251) had a direct relationship with RI ratios. He explained that many RIs described adding ground connections, labels, drilling holes and slots, and similar work that did not relate to reliability prediction.

11-140. NavCom used the Support Reallocation Method to capture the support costs of its Manufacturing Engineering Department, Test Equipment Engineering Department, Production Control Department, Quality Assurance Department and Manufacturing Project Management Department. The work performed by these departments included "participating in design reviews, providing producibility inputs to Engineering, assuring that the applicable quality standards were met, developing inspection instructions, manufacturing instructions, test equipment, procedures, and providing technical support for the actual build and test of the First Article units." (Claim at 46)

11-141. NavCom calculated a 38.6 % ratio as "a representative measurement of the amount of in-scope versus out-of-scope support effort." The 38.6 % was derived from the ratio of alleged out-of-scope non-recurring engineering costs for all 13 claims to total base contract nonrecurring engineering costs (Claim at 46; ex. G-5003 at 33). NavCom has not established that all support functions were necessarily required in all claims. This ratio also assumes that NavCom is entitled to all of the alleged out-of-scope nonrecurring engineering costs on all 13 claims.

11-142. Professor Kauffmann found numerous other problems with this method. One problem was that NavCom omitted from its original plan PCN 1110 to which the costs of the support group were charged. According to Professor Kauffmann, "[t]his oversight indicates that there was no original scope defined for support and, as a result, it is not possible to differentiate in and out of scope support activities." (Ex. G-5003 at 39)

11-143. Professor Kauffmann's report concluded with this summary:

> Each of NavCom's methods contains serious flaws that cast doubt on the accuracy, validity, and appropriateness of the resulting alleged costs. In addition NavCom's methods do not demonstrate acceptable estimating practice since they did not validate cost estimating relationships, verify database values, and use methods that minimize variance. In most of the methods, the cost estimating relationships do not demonstrate a logical relationship to the alleged out of scope work that is identified and claimed. As a result of these problems, NavCom's claimed costs are inaccurate.

(Ex. G-5003 at 54-55) NavCom has not addressed the issues Professor Kauffmann raised. None of the allocation techniques it employed have been validated in any way. NavCom presented no expert testimony to justify their use. Based on our review of the record, we agree with Professor Kauffmann's conclusions. Based on the evidence in the record, we are unable to make a fair and reasonable approximation of NavCom's damages on the six sub-claims we have found in its favor.

DECISION

Quantum Claim No. 11

NavCom acknowledges that it has the burden to prove the increased costs resulting from the changes in the work caused by the Government (app. br., vol. 14 at 61). NavCom also acknowledges that the best proof of a claim amount is actual cost information taken from the accounting records of the contractor (app. br., vol. 14 at 62). In this regard, the Federal Circuit has said, "the 'actual cost method' is preferred because it provides the court . . . with documented underlying expenses, ensuring that the final amount of equitable adjustment will be just that - equitable - and not a windfall for either the government or the contractor." *Dawco Construction, Inc. v. United States,* 930 F.2d 872, 882 (Fed Cir. 1991), *overruled in part on other grounds, Reflectone, Inc. v. Dalton,* 60 F.3d 1572 (Fed. Cir. 1995) (*en banc*).

In this case, NavCom has not established its damages by "direct and specific proof." *See Joseph Pickard's Sons Co. v. United States,* 532 F.2d 739, 742, 744 (Ct. Cl. 1976).

NavCom contends, however, that it is entitled to be compensated through the "jury verdict" method (app. br., vol. 14 at 62-64). The jury verdict method may only be used when other more exact methods cannot be applied. *Specialty Assembling & Packing Co. v. United States*, 355 F.2d 554, 572 (Ct. Cl. 1966). Three prerequisites must be met to use the jury verdict method: "(1) that clear proof of injury exists; (2) that there is no more reliable method for computing damages; and (3) that the evidence is sufficient for a court to make a fair and reasonable approximation of the damages." *Dawco,* 930 F.2d at 880.

In this case, even if NavCom can meet the first two prongs of the *Dawco* test, it clearly does not meet the second and third prongs. *Dawco* teaches that "the amount of the recovery can only be approximated in the format of a 'jury verdict' where the claimant can demonstrate a *justifiable inability to substantiate* the amount of his resultant injury by direct and specific proof." (Emphasis in original) *Dawco,* 930 F.2d at 881. In this case, NavCom's proposal described a project management system which, if implemented, would have allowed NavCom to document its out-of-scope costs. NavCom, however, did not implement the project management system. It gave no explanation of its failure to do so. Furthermore, we have found that NavCom could have issued charge numbers to keep track of its out-of-scope costs. NavCom chose not to do so because its project manager had neither the time nor the patience to do so, and because he was concerned about mischarging. We conclude that NavCom has not demonstrated a justifiable inability to substantiate the amount of its damages by direct and specific proof. Therefore, it is inappropriate to approximate the amount of recovery by way of the jury verdict method.

In addition, the evidence shows that without a detailed baseline estimate to identify in- and out-of-scope work, and without implementing its project management system, NavCom was forced to devise a complex cost allocation system to estimate its claim. In the case of Claim No. 11, NavCom used three of its allocation methods and came up with an estimate of $825,457. The Government's expert, Professor Kauffmann, found serious problems with each of the methods used. NavCom has not addressed these issues. None of the methods it employed have been validated in any way. NavCom presented no expert testimony to justify their use. Based on what we have in the record, we are unable to make a fair and reasonable approximation of the damages NavCom suffered on the four sub-claims we have found in its favor on entitlement.

CONCLUSION

Because NavCom has not demonstrated a justifiable inability to substantiate the amount of its damages by direct and specific proof, and because the evidence is insufficient for us to make a fair and reasonable approximation of its damages, we decline to use the jury verdict method to establish NavCom's damages on the six sub-claims on which we have found entitlement in its favor.

Accordingly, NavCom's appeal in Claim No. 11 is denied.

ASBCA No. 52297 - Claim No. 12
SOFTWARE AND MENUS
FINDINGS OF FACT

12-1. The specification requirements relating to the software for the 155 RTSs are contained in ¶ 3.12 of MIL-T-24664(EC):

> 3.12 Mission Critical Computer Resources. Where applicable for the following tasks, the contractor shall update any previously developed software documentation to reflect the requirements of the AN/UPM-( ) being procured under this contract.

(R4, tab 26 at 002286)

12-2. Two kinds of software documents are involved in Claim No. 12: Program Performance Specification (PPS) and Program Design Specification (PDS) documents (tr. 16/10). The PPS is the document where all the requirements for the software to be produced are specified (tr. 16/120, 141). The PPS tells the engineer "what the software is required to do" (tr. 16/122). Upon completion and approval of the PPS, it becomes the functional baseline of the software (tr. 16/122-23). NavCom was responsible for developing the PPS. The applicable provision of MIL-T-24664(EC) provides:

> 3.12.1 Program Performance Specification. The contractor shall determine the detailed program performance requirements for all system computer programs as specified in Section 5.1 (Program Performance Requirements) of MIL-STD-1679, and the specification.

(R4, tab 26 at 002286)

12-3. In connection with the PPS, MIL-STD-1679 (MILITARY STANDARD, WEAPON SYSTEM SOFTWARE DEVELOPMENT) provides:

> 5.1 Program performance requirements. The contractor shall determine the detailed program performance requirements for the weapon system software. The contractor shall utilize the basic descriptive requirements and design information provided by the procuring agency to create the program performance requirements. This information may be augmented by studies, analyses, visits to operational units, and surveys as necessary.

> The program performance requirements are subject to the review and approval of the procuring agent.

(R4, tab 250 at 008113)

12-4. Once the PPS defines what the software is supposed to do, the PDS documents how the PPS requirements are fulfilled. An approved PDS constitutes the initial design of the software. It allows the contractor to proceed with the implementation (or coding) phase of the software. (Tr. 16/123) Under MIL-T-24664(EC), NavCom was responsible for developing the PDS:

> 3.12.2 Program Design Specification. The contractor shall develop the detailed design requirements complying with Section 5.2 (Program Design Requirements) of MIL-STD-1679 and based on the government-approved program performance requirements.

(R4, tab 26 at 002286)

12-5. In connection with the PDS, MIL-STD-1679 provides:

> 5.2 Program design requirements. The contractor shall develop the detailed program design requirements in accordance with the detailed program performance requirements approved by the procuring agency and shall comply with other design constraints and standards as specified by the procuring agency.

(R4, tab 250 at 008114; tr. 17/113)

12-6. MIL-STD-1679 required NavCom to prepare the PPS first, and only after approval by the Government of this initial documentation, would the Government approve the PDS (tr. 16/16-17).

12-7. In a memorandum dated 12 August 1985, commenting on NavCom's PDS for the 149 Contract, the Government wrote:

> b. The revised subject document should be carefully proofread before resubmission to SPAWAR. The present subject document contains some minor errors which detract from what is on the whole a well-prepared document.

(R4, tab 251 at 008138) When NavCom bid the 155 Contract, Van Cleave believed that "the 149 PDS was quite acceptable to the government. . . . We had this letter. It says it's a well prepared document. We took heart in that" (tr. 16/18).

12-8. Van Cleave testified that when he submitted NavCom's proposal for the 155 Contract, he "understood that what we needed to do was to update . . . those previously approved documents, and resubmit them" (tr. 16/20). NavCom's proposal stated:

> THE CURRENT SOFTWARE AND DOCUMENTATION WILL REQUIRE AN UPDATE TO PROVIDE THE ADDITION OF NEW REQUIREMENTS AND IMPROVEMENTS IN SYSTEM OPERATION. BOTH IN HARDWARE AND SOFTWARE. MIL-STD-1679 WILL BE ADHERED TO THROUGHOUT THIS DEVELOPMENT UPDATE.

(R4, tab 17 at 001372)

12-9. At the time it submitted its proposal, NavCom was aware that some changes to the 149 Contract software were inevitable. For example, NavCom was aware that combining the RF modules, removing the ICA/ACM circuitry outside the RTS enclosure, and changing to a lighter display, all would require software changes. These changes were "factored" into NavCom's proposal. (Tr. 16/27-28)

12-10. There were other changes as well. For example, the Government had deleted a large portion of the "convenience logic" from the 149 specification, added a 60 MHz output and new pulse trains. These changes would also require software changes (tr. 17/41). We find there were substantial changes between the 149 and the 155 Contracts requiring substantial software changes and development.

12-11. The 149 Contract was an R&D effort. The software deliverables under that contract were not expected to be used for life-cycle maintenance purposes. Had the Government decided to exercise its production option under the 149 Contract, there would have been a "much more rigorous review" of the software under that contract. (Tr. 17/36) The Government typically does not pay for software documentation for a contractor's own use (tr. 17/65). In this case, the Government did not purchase the software for NavCom's use. It purchased the software for use as reference books for life cycle maintenance of the 155 RTS. In the event software changes have to be made by Government personnel in the future, these reference books have to be as error-free as possible. (Tr. 17/63-64)

12-12. Software development was a concern to the Government "from Day 1" of the 155 Contract (tr. 17/42). NavCom indicated at a March 1989 meeting that it would use the Z-80 assembly language for its software. The Government questioned whether that language was appropriate in view of the advances made. (Tr. 17/43) NavCom estimated that

it would be able to reuse 65% of the 149 Contract software code (R4, tab 131 at 006375; tr. 17/44). The Government felt this estimate was "rather ambitious" for the changes required by the 155 RTSs (tr. 17/45). As it turned out, only 23% of the 149 Contract software was reused in developing the 155 Contract software (tr. 17/36).

12-13. The Government also voiced its concern about a repeat of what it had seen with the 149 Contract where NavCom's software "seemed to lag . . . far behind the hardware." Without the 155 RTS design being finalized, the Government questioned whether NavCom was even ready to develop software. (Tr. 17/44-45)

12-14. At a preliminary program review meeting held in May 1989, NavCom repeated it was going to reuse 65% of the 149 Contract software (tr. 17/46). The Government expressed new concerns because NavCom had decided to do the "high order language" on the new software and then "compile it down to the Z-80 code."[25] The Government was concerned about uniformity and gave NavCom an action item to see what impact there might be "module by module." (Tr. 17/47)

12-15. Because codes were not carried over from the 149 RTS on numerous modules, and because some modules had no software written for them as a result of specification changes, and changes initiated by NavCom on the 155 RTS, we find that the Government's estimate of "much higher than 50 percent" of the software had to be written a more realistic assessment (tr. 17/50-51). We find that NavCom underestimated the software changes required to be developed for the 155 Contract.

PPS Development

12-16. Finalizing the test plan and test procedures for the 155 RTS was directly affected by changes to the PPS (tr. 16/142-43). NavCom made its first 50-page PPS submission by letter dated 3 April 1989 (R4, tab 273). The Government reviewed the submission, and by letter dated 17 May 1989, advised NavCom that several discrepancies were found and approval could not be granted. NavCom was requested to correct the discrepancies in accordance with the enclosed comments and resubmit the PPS for review within 45 days. The Government's comments were set out in less than two pages. NavCom received the Government's comments on 23 May 1989. (R4, tab 274)

12-17. NavCom submitted its PPS (Revision A) by letter dated 29 June 1989, about one month later (second submission). In addition to the PPS, NavCom submitted a 10-page response to the Government's comments. (R4, tab 275) The Government reviewed Revision A, and by letter dated 31 July 1989, advised NavCom that because of the discrepancies found, Revision A was not approved. NavCom was told to correct the PPS in accordance with the comments set out in the enclosure and to resubmit it for review within 30 days. The Government's comments were set out in two pages. (R4, tab 276)

12-18. By letter dated 3 October 1989, over two months later, NavCom submitted its PPS, Revision B (third submission). In addition to the PPS, NavCom submitted an eight-page response to the Government's comments (R4, tab 277). The following excerpts illustrate the nature of some of the Government comments and NavCom's positions on them:

> Comment 1: Paragraph 3.2.1.2: Change 'When attached, it will supply all control and video signals needed by the UUT for operation' to 'When attached, it will route input power to, and supply all control and video signals needed by the UUT for operation'.
>
> Response 1: Paragraph 3.2.1.2 has been changed exactly as requested.

(R4, tab 227 at 008475) NavCom does not contend that the Government's comments were wrong, but contends at the hearing that the change had no effect on designing the software from the PPS (tr. 16/147).

> Comment 5: Paragraph 3.4.1.2.1: Change 'The Transponder Manual will function allow' to 'The Transponder Manual function will allow'.
>
> Response 5: Paragraph 3.4.1.2.1 has been changed exactly as requested.

(R4, tab 227 at 008476) NavCom acknowledges that "[t]his is a typo . . . confusing at first reading," but contends that it had "little effect on its ability to use the document" (tr. 16/148).

12-19. The Government reviewed NavCom's PPS, Revision B, and by letter dated 15 November 1989, advised NavCom that because of the discrepancies found, the PPS was not approved. NavCom was told to correct Revision B in accordance with the comments enclosed and to resubmit it for review within 25 days. The Government's comments were limited to three paragraphs. (R4, tab 278)

12-20. NavCom submitted its PPS, Revision C, by letter dated 20 December 1989 (fourth submission) (R4, tab 279). The Government reviewed the PPS and provided its comments in an enclosure to its 27 March 1990 letter. The letter approved NavCom's PPS on the condition of satisfactory resolution of the comments provided. (R4, tab 280) NavCom submitted its PPS, Revision D, by letter dated 27 April 1990 (fifth submission) (R4, tab 281). The Government reviewed the submission and finally approved it by letter

dated 13 August 1990 (R4, tab 282). Approval of the PPS took 5 submissions, 4 rounds of comments, and 16 months.

PDS Development

12-21. NavCom made its first PDS submission on 28 July 1989 (R4, tab 283). The submission was over 560 pages long (ex. A-6010; tr. 16/126, 17/23). Accompanying the submission was a DD Form 250 and NavCom's Certification Of Technical Data Conformity which states:

> The Contractor, NavCom Defense Electronics, hereby certifies that, to the best of its knowledge and belief, the technical data delivered herewith under Contract No. N00019-88-C-0228 is complete, accurate, and complies with all requirements of the contract.

(R4, tab 283 at 008657-58) The Government considered the certified submission as "a final product" (tr. 17/67).

12-22. The Government reviewed the PDS submission and by letter dated 12 October 1989 advised NavCom that due to discrepancies found the PDS could not be approved. NavCom was told to correct the discrepancies in accordance with the enclosed comments and to resubmit the PDS within 25 days. On the 560 plus page submission, the Government provided 26 pages of comments. (R4, tab 285; tr. 17/68)

12-23. NavCom acknowledged that its first PDS submission contained errors. It attributed the errors to the pressure it was under to submit the document on time. (Tr. 16/153-54) Blaylock, who reviewed NavCom's submission testified that it was "very poorly . . . QA'd . . . almost a draft . . . with huge numbers of grammatical type mistakes that you wouldn't expect in a formal deliverable for the Government" (tr. 17/31). NavCom has not included the cost of addressing the first round of Government comments in its request for equitable adjustment -- "[t]he first round is on us" (tr. 16/43, 96). NavCom apparently did not even review the PDS before submitting and certifying it. It acknowledged that it only became aware of the errors "by the time the first informal comments came around" (tr. 16/96). That NavCom would certify its first PDS submission as complete, accurate and in full compliance with all contract requirements caused the Government to be more vigilant in reviewing subsequent submissions (tr. 17/74).

12-24. NavCom resubmitted its PDS by letter dated 27 November 1989. Like its first submission, this second submission was certified as complete, accurate and in compliance with all contract requirements, and was submitted with a DD Form 250. (R4, tab 287) This submission included a 44-page paragraph-by-paragraph response to the

Government's comments. A sample of the Government's comments and NavCom's responses is set forth below:

> Comment 1: 1.1 Pg. 17
> Change "program specification" to "Program Design Specification".
>
> Response 1: Will be corrected.
>
> . . . .
>
> Comment 63: 3.2.2.1.12.4 ISOLAT Pg. 161
> Step 2.2.2.2.4 appears to be a CASE statement without any cases, please clarify.
>
> Response 63: This unit has been updated.

(R4, tab 287 at 008745, 008763)

12-25. Michael LaBudda, NavCom's lead software engineer on the 155 Contract, acknowledged that NavCom's second PDS submission was deficient and "looked bad to the government," and that he knew "we were in deep trouble, and we needed to produce a document that the government would be happy with . . . making sure all the page numbers were correct . . . there were no misspellings and doing grammatical checks and things of that nature" (tr. 16/124-25).

12-26. The Government reviewed NavCom's second PDS submission and by letter dated 9 March 1990 advised NavCom that approval of the RTS was withheld pending satisfactory resolution of the comments made in the accompanying enclosure. The Government comments consisted of three parts: Part I commented on problems that were found throughout the submission; Part II commented on the overall format of the submission; and Part III commented on the appendices. (R4, tab 290)

12-27. The Government's second round of comments wanted NavCom to change "PwMSR" to "PWMSR" in ¶ 3.2.2.1.8 at 168 (R4, tab 290 at 008804). NavCom concedes that it had made a typographical error but contends that the error would not have affected its ability to implement the software code (tr. 16/134). The Government contends that while the error might not affect NavCom, Government users could mistakenly believe a "different variable" was indicated (tr. 17/33).

12-28. In another example, the Government wanted NavCom to change "Call Vrslt" to "Call VRSLT" in ¶ 3.2.2.1.3 at 144 (R4, tab 290 at 008804). NavCom contends that using small letters would not have affected its ability to use the PDS (tr. 16/134). The

Government contends that consistency in the use of terminology is important to its life cycle maintenance of the equipment (tr. 17/63-64).

12-29. NavCom resubmitted its PDS under a DD Form 250 certification by letter dated 5 October 1990 (R4, tab 295). This was NavCom's third PDS submission. By letter dated 14 December 1990, NavCom submitted change pages to its third submission. (R4, tab 296) The Government notified NavCom by letter dated 27 February 1991 that its PDS was conditionally approved subject to satisfactory resolution of the comments in an enclosure. The comments were provided to NavCom in advance and discussed during meetings held during the week of 28 January 1991. The letter requested resubmission of the PDS 30 days after completion of first article testing (R4, tab 300). Approval of the PDS took 3 submissions, 3 rounds of comments, and 19 months.

12-30. Paragraph 2.1.1 of the Government's comments asked NavCom to "Delete the periods after 'software)' and 'usage)' in the list of appendices" at sheet 29, ¶ 1.2. of the PDS (R4, tab 300 at 008858). NavCom contends that "this is a trivial nitpicking kind of comment that had no effect on developing the software" (tr. 16/139). Paragraph 2.1.2. of the Government's comments advised NavCom that the word "Electronic" on sheet 30, ¶ d, line 4, should be "Electronics." (R4, tab 300 at 008858) NavCom contends that this was harmless and had no effect on its software development (tr. 16/139).

12-31. When asked what was wrong with the Government's comments, Van Cleave testified:

> A. Well, the comments very rarely tied to any contractual requirement, and they were disorganized. They were, in many cases, simply wrong comments.

(Tr. 16/40-41) According to NavCom, the Government's comments disrupted and delayed the approval of the PPS and PDS and NavCom had to put "a lot of people on it, and it certainly cost us a lot of money to react to all of these comments" (tr. 16/41). As a result, "everything really radically changed in the documentation" (tr. 16/33).

12-32. While NavCom accuses the Government of being nitpicking and unreasonable in reviewing its PPS and PDS submissions, the evidence shows that NavCom recognized internally that its software quality program was deficient. A NavCom memorandum dated 18 August 1989 reported that "[o]ur internal control system for software development is not mature enough . . . to satisfy a DCAS audit . . . ." (R4, tab 385). As a result of a Quality System Review (QSR) conducted at NavCom's facility from 27 November to 6 December 1989, Defense Contract Administration Services Region (DCASR), Los Angeles, issued a Method "C" Corrective Action Request by letter dated 18 December 1989 (GSR4, tab 1173).

12-33. The QSR identified three major areas of concern. With respect to the two areas which affected NavCom's software development, DCAS's 18 December 1989 letter to NavCom's president stated:

> Software Quality Program
>
> The Quality Program was ineffective in detecting, reporting, analyzing and correcting software problems and deficiencies. Subsequently nonconforming product has been submitted to the government for acceptance. Some of the indicators of this breakdown are the letters from the procuring agency rejecting deliverable product, the CDRL delivery schedule showing repeated document submittals and the QSR team findings showing product as still nonconforming.
>
> Software Engineering
>
> The Software Quality Program failed to ensure all contractually required Software Engineering standards, techniques and methodologies were complied with during the software development process. The code was not developed in a High Order Language (HOL) and no evidence of waiver of this requirement was available.

(GSR4, tab 1173) The evidence shows that NAVAIR, through Blaylock, "join[ed] forces" with NavCom in seeking to resolve DCAS's concern with respect to HOL (tr. 17/81, 83).

12-34. As the "primary reviewer and control point" of software submittals under the 155 Contract, Blaylock's review criteria were "fairly well standard": the content and format of submittals were reviewed against the contract data item description. Submittals were reviewed for "technical correctness" and "technical accuracy." (Tr. 17/28-29) Spelling and grammatical errors would not in and of themselves cause submittals to be rejected. If a submittal was going to be disapproved or conditionally approved for technical reasons, and NavCom was required to resubmit anyway, the Government would provide its comments on spelling and grammatical errors so that NavCom could correct them. We find this approach made practical sense. There was no reason for NavCom to resubmit a document with known errors, particularly when the Government went through the trouble of identifying them for NavCom.

12-35. Until the 155 RTS hardware design was finalized, the software documentation must leave the affected areas "[t]o be determined" or "TBD" (tr. 16/151). LaBudda acknowledged that software submissions containing "TBDs" were incomplete (tr. 16/152). Based on the evidence in the record, we find that multiple submissions of

NavCom's software documentation were attributable to NavCom's ineffective Software Quality program, to the poor quality of its software submissions, to NavCom's decision to develop its PPS and PDS concurrently, and to its ongoing hardware revisions.

Menus

12-36. The menu of the RTS is a screen on the display that enables an operator to select a function by entering data on a keypad (tr. 16/44). Generally, fewer menus are better because operators end up memorizing the menus they work with and "memorizing 20 menus is a lot easier than memorizing 114" (tr. 16/114).

12-37. MIL-T-24664(EC) contains the following requirements with respect to menus:

> 3.6.19 Microprocessor or microcontroller control.
>
> . . . .
>
> . . . The firmware shall provide extensive operator prompting via menu-type displays, flexible syntax entries, and so forth. The firmware shall control the keys for entry of switch and variable setting data. The operator shall not require any programming knowledge to use the equipment, and entries shall be made with as few keystrokes as possible. It shall be acceptable for the firmware to print questions and ask the operator to enter YES/NO (Y/N) or a number (1/2) as a response. It shall require less than 1 hour of training to understand how to select any and all switches and variable settings. All menu type displays and operator prompts shall be subject to the approval of the procuring activity.
>
> . . . .
>
> 3.6.19.1.2.2 Help menus. The equipment shall contain helpful messages or menus. The help menus shall be subject to the approval of the procuring activity.

(R4, tab 27 at 002672; tr. 17/34-35) The requirements for approval by the procuring activity of all menu type displays and operator prompts (¶ 3.6.19) and of the help menus (¶ 3.6.19.1.2.2) was not a part of the 149 Contract. They were added as new requirements in the 155 Contract (tr. 17/33-34).

12-38. The contract did not use the term "user friendliness." In determining whether NavCom's menus were sufficiently user-friendly, the Government reviewed NavCom's proposed menus against the guidelines set out in ¶ 3.6.19, *i.e.*, no programming skills would be required to use the equipment, and less than one hour of training would be required for an operator to select any and all switches and variable settings (tr. 17/54).

12-39. The Government's 24 June 1986 report on its NRL/NESEA testing contained the following comments with respect to NavCom's menus on the 149 EDMs:

> 6. One area of concern that arose during the testing was user friendliness. Both NRL and NESEA, after operating the units for some time, found that constant use of notes or manuals is required to locate the proper menu for making selections and entering values. This cannot be labeled as nonconformance since it is such a subjective issue; however, NESEA personnel feel that the general grouping of functions and menus must be changed for production. This should not be a major problem to the contractor, since most of the software routines could be retained and regrouped as required.

(ASR4, tab 551 at 010297)

12-40. The only feedback NavCom received from the Government on the 149 Contract EDMs regarding menus was that the Government thought there were not enough "Help" menus. NavCom addressed this concern in its proposal for the 155 Contract:

> 4.0.1.2.12 Add comprehensive "help" menus
>
> New help menu displays have been designed to assist the Test Set operator. On line help is available for general Test Set operations such as controlling the menus and entering available data from the keypad as well as specified held [sic] for correcting error conditions, generating replies, and identifying signal inputs to the measurement section's multiplexer.

(R4, tab 17 at 001415; tr. 16/50)

12-41. NavCom acknowledges that in putting the interface circuitry in the ACMs, and in going to a lighter display, some changes to the 149 menus would be necessary (tr. 16/55-56). NavCom took these changes into consideration in reducing the 149 menus to roughly 100 menus for the 155 Contract. This effort involved editing out a few lines and a few spaces. (Tr. 16/57) NavCom included a few sample menus in its proposal for the 155 Contract (Test Mode Select Menu and System Reset Menu) (R4, tab 17 at 001418,

001535). With minor modifications, these were the menus used in the 149 Contract. By including these menus, NavCom wanted to show the customers that "we were going to give him menus and that the menus . . . were going to be structured similar to the 149 [menus], if not identical" (tr. 16/49).

12-42. NavCom made a presentation of its menu approach at the first program review meeting held in March 1989. It received no negative feedback from the Government. (R4, tab 131; tr. 16/58-59) At a subsequent program review meeting held in May 1989, NavCom made a presentation on its menu structure (GSR4, tab 1154; tr. 16/60). At this meeting, the Government wanted to examine closely whether NavCom's menus were "user friendly" and was interested in reducing the number of menus (GSR4, tab 1154 at 000580; tr. 16/60-61). As a result of this meeting, NavCom reduced the number of its menus to "75 or so" (tr. 16/61-62).

12-43. The programmer NavCom assigned to work on the menus did not have any background in IFF equipment. Consequently, she lacked the insight necessary to develop a set of menus that was easy to use. (Tr. 17/55, 75) After NavCom eliminated and combined various menus to "60 or 70," it "bottomed out" (tr. 16/110).

12-44. At this point, NavCom essentially gave up and invited the Government to take over its work. Van Cleave testified:

> . . . We were getting nowhere with the menu approval, absolutely nowhere. The Navy wanted to boil down the number of menus and make all kinds of user friendly changes to it.
>
> To handle that through documentation and through PDS approval was just a nightmare . . . . It looked like we were going nowhere fast, spending a lot of money doing it. So we said, well, Mr. Blaylock, why don't you send your team out here to NAVCOM for a month or so and figure out the menus; may be that will work.

(Tr. 16/92)

12-45. At the January 1990 program review meeting, NavCom suggested that it would set up a modem for three weeks instead so that the Government "could play with the menus all day long . . . make any comments you want and look at them as much as you wanted." The Government thought it was a "great idea," and NavCom set up the modem. (Tr. 16/66)

12-46. On 28 February 1990, Blaylock faxed 20-some sample menus to NavCom. He made clear that the Government was not directing any changes. The cover sheet stated:

> THESE MENUS ARE NOT FOR ANY ACTION, BUT TO LET YOU KNOW WHAT DIRECTION WE ARE LEANING. PLEASE CALL ME ONCE YOU HAVE HAD A CHANCE TO LOOK THEM OVER.

(ASR4, tab 581; tr. 16/67-68, 17/75-76) By combining screens, the Government showed how some 60 menus could be reduced to 20 or so (ASR4, tab 581; tr. 17/90-91). Had NavCom assigned someone with IFF background to the task, we find that it could have accomplished the same reduction. NavCom alleged at the hearing that "[t]he Government came in on February 28, 1990, and dictated the menus to us," and it alleged that it had to discard all the work it had done up to that point (tr. 16/110).

12-47. NavCom found out that while the modem made it easier for the Government to comment on its menus, it did not make NavCom's work easier (tr. 16/93). Having invited the Government to take a more active part in its menu development, NavCom was reluctant to make changes. Van Cleave's internal highlights for the week ending 11 March 1990 remarked:

> We assessed the myriad of recommended software menu changes received from the Navy, who are convinced that they can delete certain menus to "make it easier" for us, but it won't. . . .

(GSR4, tab 1317 at 021045) Van Cleave explained that he really did not care how many menus there were. He was more interested in freezing the menus because reducing the number of menus required more software changes (tr. 16/70).

12-48. It was reported at an 18 April 1990 NESEA meeting that NavCom's existing menus lacked proper organization for efficient set-ups and were generally user "unfriendly," and NavCom had made no effort to revise the existing menus in accordance with the Government's recent recommendations. (ASR4, tab 585; tr. 16/72) Since the menus were required to run the first article tests, the Government made clear that the menus had to be approved before it would approve the FAIPT (tr. 16/63, 77).

12-49. The Government ended up working with NavCom's programmer "to develop a good set of menus that [were] short [with] logical groupings of functions" (tr. 17/55). There was no goal to reduce the menus to any specific number. The Government worked with NavCom's programmer "attempting to make the menus the most efficient," and ended up with 23 menus. (Tr. 17/56)

12-50. NavCom submitted its software menus for approval by letter dated 18 October 1990. By letter dated 15 November 1990, the Government approved the menus

conditional upon "the satisfactory incorporation of the menus into all appropriate CDRL Items." (R4, tab 324)

Claim

12-51. NavCom seeks $969,452 for Claim No. 12 (Claim at 626; tr. 16/78). In computing its claim, NavCom first identified the periods in which the software design work took place (tr. 16/79). It then identified the labor hours and labor costs for the periods identified (Claim at 607). Acknowledging that some of the Government's comments were valid, NavCom's claim was based on "the ratio of invalid comments to total comments" (tr. 16/81). In determining whether a Government comment was appropriate or justified, NavCom had "half a dozen or so categories." The largest category dealt with whether a comment could be tied to a contract requirement. Inappropriate comments included those NavCom considered "unnecessary" and "would do more harm than good." (Tr. 16/102)

12-52. The person who supposedly went through all of the Government's comments did not testify (tr. 16/103, 156). There is no contract requirement for correct spelling and grammar. Presumably, under NavCom's guidelines, comments pointing out incorrect spelling and grammar would have been considered inappropriate or unjustified. During the course of the hearing, NavCom picked certain examples to illustrate its point. We have examined these and other comments. We find NavCom's submissions to have been lacking in quality. We do not find the Government's comments to have been unjustified, excessive or otherwise unreasonable.

DECISION

SOFTWARE AND MENUS

NavCom contends that it was misled into believing that the 155 Contract permitted it to "re-use 149 [software] documents to a substantial extent." It contends that the specifications of the two contracts were the same, and that the Government had approved the software (PPS and PDS) documents submitted by NavCom on the 149 Contract. (App. br. at 25) NavCom points out that the RFP on the 155 Contract called for NavCom to simply "update" the "previously developed software documentation" (app. br. at 26).

NavCom had planned to reuse 65% of the 149 Contract software. As it turned out, only 23% of the 149 Contract software could be and was reused in developing the software for the 155 Contract. The 155 RTS combined the RF modules, "externalized" the ICA/ACM circuitry, and changed to a lighter display. In addition, the Government deleted a large portion of the "convenience logic" from the 149 specification, added a 60 MHz output and new pulse trains. We have found these were substantial changes between the 149 and the 155 Contracts, and that NavCom underestimated the software changes required to be developed for the 155 Contract. We conclude that NavCom unreasonably assumed that

it could satisfy the 155 Contract software requirements by re-using 65% of the software developed for the 149 Contract, and by merely updating the 149 Contract software.

In this connection, the contract clearly did not represent that all NavCom had to do was to update the 149 Contract software. The specification (¶ 3.12) allowed for updates "*[w]here applicable* . . . to reflect the requirements of the [155 RTS] being procured under this contract" (emphasis added). NavCom's argument that a mere update of the 149 Contract software would be sufficient appears to be even more tenuous in light of the fact that the 149 Contract was an R&D effort, and the software developed for the 155 Contract was expected to be used by Government personnel for life cycle maintenance. In addition, whatever the Government might have approved under the 149 Contract, such approval is not sufficient as a sequence of previous conduct between the parties so as to constitute a course of dealings. *See Longmire Coal,* 86-3 BCA at 96,603-605; *Kvaas Construction,* 94-1 BCA at 131,973.

NavCom contends that the Government unreasonably demanded multiple submissions of software documentation (PPS and PDS) to correct errors which were not tied to any contract requirements and did not affect its ability to use or develop software. We have found that multiple submissions of NavCom's software documentation were the direct result of NavCom's ineffective Software Quality program, of the poor quality of its submissions, of its decision to develop its PPS and PDS concurrently, contrary to the requirements of MIL-T-24664(EC) and MIL-STD-1679, and to its ongoing hardware revisions.

We disagree with NavCom's assertion that the Government was not entitled to point out errors unless it could tie the errors directly to contract requirements. Most of the examples given in this category related to misspellings and grammatical errors in the NavCom's deliverables. The Government paid for these deliverables. Consequently, the Government was entitled to have these deliverables meet certain minimal standards pertaining to spelling and grammar.

While NavCom concedes that certain errors were made, it argues that since the errors did not affect its ability to use or develop software they need not have been corrected. This argument assumes erroneously that the Government purchased the software for NavCom's benefit. This was not the case. The Government purchased the software for its own use. Since Government personnel would be expected to make changes to the software during the useful lives of the 155 RTSs, the Government was entitled to have its "reference books" as error-free as possible.

With respect to the software menus, the Government's 1986 NRL/NESEA report had found that NavCom's 149 menus needed to be more user friendly. NavCom contends that the Government had superior knowledge, and its failure to disclose this finding prevented NavCom from factoring the estimated cost of making user friendly menu changes

into its proposal and caused it to incur "far more cost than it had anticipated when preparing its proposal." (App. br. at 33-35)

We have said that "[t]he theory of superior knowledge does not apply unless there is a showing that the balance of knowledge is so clearly on the Government's side that a shift of the normal assumption of risk from the contractor to the Government is warranted." *Martin Paving Company,* ASBCA No. 48279, 97-2 BCA ¶ 29,085, *aff'd*, 173 F.3d 433 (Fed. Cir. 1998) (table), *citing Gulf and Western Industries, Inc.,* ASBCA No. 21090, 87-2 BCA ¶ 19,881. NavCom bears the burden of showing that: (1) it undertook to perform the contract without vital knowledge of a fact that affects performance costs or duration; (2) the Government was aware the contractor had no knowledge of and had no reason to obtain the information; (3) any contract specification supplied misled the contractor, or did not put it on notice to inquire; and (4) the Government failed to provide the relevant information. *E.g., Hercules Inc.,* 24 F.3d at 196; *American Shipbuilding Co.*, 654 F.2d at 79.

The contract did not use the term "user friendliness." In determining whether NavCom's menus were sufficiently user friendly, the Government reviewed NavCom's proposed menus against the guidelines set out in ¶ 3.6.19 of the specification. In this case, the Government would have considered NavCom's menus acceptable if an operator could be trained to use the equipment in less than an hour, and if the RTS could be operated by someone without programming knowledge. One of the ways to achieve user friendliness was to reduce the number of menus because operators tend to memorize menus, and memorizing a few menus is better than memorizing a large number of them.

The need to simplify the menus to meet the requirements of ¶ 3.6.19 is knowledge that NavCom could have and should have derived directly from the specification. It is not knowledge the Government needed to reveal. The fact that the Government added a new requirement for help menus in the 155 Contract should have alerted NavCom that simply updating the 149 Contract menus would not be sufficient. In any case, since the NRL/NESEA report did not establish the menu requirements for the 155 Contract, nor did it contain any information that NavCom could not have derived from the 155 specification, we conclude that the Government did not fail to provide relevant information vital to NavCom's performance.

CONCLUSION

Because there were substantial changes between the 149 EDMs and the RTSs to be produced under the 155 Contract, and because NavCom erroneously assumed that it could simply update the software documentation developed under the 149 Contract, we hold that NavCom is not entitled to an equitable adjustment for the efforts required to obtain approval of the PPS and the PDS.

Because multiple submissions of NavCom's software documentation were the direct result of its ineffective Software Quality program, of the poor quality of its submissions, of its decision to develop the PPS and the PDS concurrently, contrary to the requirement of the specifications, and of its ongoing hardware revisions, we hold that NavCom is not entitled to an equitable adjustment.

Because the Government only required NavCom to comply with the requirements of the contract specification (¶ 3.6.19) and because the 1986 NRL/NESEA report did not contain any information that could not have been derived from the 155 specification, we hold that NavCom is not entitled to an equitable adjustment under the superior knowledge doctrine.

Accordingly, NavCom's appeal in connection with Claim No. 12 is denied.

ASBCA No. 52298 - Claim No. 9
LEVEL OF REPAIR ANALYSIS (LORA) REPORT
FINDINGS OF FACT

9-1. Under the 155 Contract, NavCom was required to submit several logistics-related deliverables. The contract Statement of Work (SOW) contains the following requirement with respect to "Maintenance Management" (¶ 3.7):

> 3.7.1 Level of Repair Analysis (LORA). The contractor shall establish, implement, and maintain a Level of Repair Analysis (LORA) Program in accordance with MIL-STD-1390B.

(R4, tab 15 at 001051; tr. 18/13, 133)

MIL-STD-1390B

9-2. According to MIL-STD-1390B (Navy), 1 December 1976, the purpose of LORA is to "establish the least cost feasible repair or discard decision alternative for performing maintenance actions and to influence the equipment design in that direction. The maintenance policy which results from performing an LOR analysis will, therefore, reflect the least-cost feasible method of logistically supporting the naval material" (GSR4, tab 1001 at 9). MIL-STD-1390B provides that "[a]lthough the LOR process can be an independent effort, it should, to the maximum extent feasible, be an integral part of an ILS (Integrated Logistic Support) program and a total LSA (Logistic Support Analysis) whether the acquisition be an in-house or contractor effort." (GSR4, tab 1001 at iii)

9-3. The LORA is an economic model that recommends whether the Government should discard or repair an item when it fails (tr. 18/117). If an item is repairable, the LORA recommends where the item should be repaired: at the "organizational" level where

the equipment is actually used; at the "intermediate" level which is between the "organizational" and the "depot" levels; or at the "depot" level which is a facility the Government sets up for the purpose of repairing equipment (tr. 18/67). LORA consists of "computing various cost elements (i.e., cost of inventory, cost of training, cost of support equipment, etc.) for discard and all repair alternatives, summing these cost elements by alternative, comparing the sums and selecting the lowest as the least cost decision alternative" (¶ 5.3.1.1, MIL-STD-1390B, GSR4, tab 1001 at 13).

9-4. Under ¶ 6 of MIL-STD-1390B, the procuring activity is given the option of who is to perform the LOR Analysis:

> First, the contractor is contractually responsible for complete LOR analyses performance to include input data derivation, analyses performance, and report preparation. . . . Second, the contractor is contractually responsible solely for input data derivation for Navy performance of the required LOR analyses.

Detailed requirements for the contractor LORA performance option are delineated in Section 5 of MIL-STD-1390B. The requirements for the Government LORA performance option are delineated in Section 6 of MIL-STD-1390B. (GSR4, tab 1001 at 16)

9-5. Under either option, the contractor's LOR Program Plan must be included as a part of its response to the RFP. The plan is required to describe "how the contractor will conduct the LOR program to fulfill the requirements of this standard [MIL-STD-1390B]." (¶¶ 5.1.1, 6.1, GSR4, tab 1001 at 12, 16)

9-6. If the Government chooses to have the contractor perform LORA, ¶ 5.4 (LOR Data Requirements) requires the submission of: (1) LOR Program Plan (¶ 5.4.1); (2) LOR Analysis Report (¶ 5.4.2); (3) LORA Status Report (¶ 5.4.3); and (4) LOR Summary Report (¶ 5.4.4) in accordance with the corresponding DID's (Data Item Descriptions) and CDRL (Contract Data Requirement List). Paragraphs 5.4.1 and 5.4.2 provide:

> 5.4.1 LOR Program Plan. After the award of a contract an updated Program Plan, DID Number DI-L-2084, will be submitted to the procuring activity. (5.1.3)
>
> 5.4.2 LOR Analyses [sic] Report. Unless otherwise specified by the procuring activity the results of the LOR analyses [sic] shall be submitted to the procuring activity in accordance with the CDRL and DID DI-L-2085. The results shall include all data elements used, a summary of the calculations, and the contractor LOR recommendations.

(GSR4, tab 1001 at 14)

9-7. According to MIL-STD-1390B, the contractor's LORA should include: (1) an economic analysis ("collecting and computing the logistic costs associated with maintenance alternatives from which LOR recommendations can be made"), and (2) a non-economic analysis ("evaluating significant non-economic pre-empting factors from which LOR decisions are made.") (¶¶ 5.3.1.1 and 5.3.1.2, MIL-STD-1390B, GSR4, tab 1001 at 13).

9-8. If the Government chooses to do the LORA itself, ¶ 6.2 (LOR Data Requirement) specifies that "[t]he following LOR data requirement will normally be prepared and forwarded to the procuring activity in accordance with the corresponding DID and with the CDRL," in addition to the LOR Program Plan (¶ 6.1):

> 6.2.1 LOR Input Data Report. Unless otherwise specified by the procuring activity a LOR input data report shall be sumitted [sic] to the procuring activity in accordance with the CDRL and DID Number DI-L-2155. As a minimum, the report shall include the data elements and values developed in accordance with the requirements of an appropriate appendix. . . .

(GSR4, tab 1001 at 16) DID DI-L-2155 described the purpose of a LOR Input Data Report:

> The data described herein is required by the Navy for input into the LOR Analysis. This report is prepared by the contractor and delineates the contractor furnished data *required by the Navy to perform a LOR Analysis*.

(Emphasis added) (R4, tab 186)

The 155 Contract

9-9. On the 155 Contract, CDRL C001 called for a "LOR Analysis Report" in accordance with DI-L-2085A. (R4, tab 26 at 002103) DID DI-L-2085A described the purpose of a LOR Analysis Report:

> This report is to advise the procuring activity of *the results of the LOR analysis conducted*. This report will document and support *the contractor's recommendations* for most economical repair levels, repair versus discard at operational site, spare part provisioning, etc.

(Emphasis added) (R4, tab 189) CDRL C002 of the 155 Contract called for a "Plan, Program Level of Repair (LOR) *Government Analysis*" in accordance with DI-L-22332C (emphasis added) (R4, tab 26 at 002103).

9-10. DI-L-22332C (5 May 1977), PLAN, PROGRAM, LEVEL OF REPAIR (GOVERNMENT ANALYSIS), described its purpose as follows:

> The plan describes how and when the Level of Repair (LOR) program will be conducted to generate required data *necessary for the Government to perform an LOR analysis.*

(Emphasis added) (R4, tab 185)

NavCom's Cost Estimates

9-11. The cost estimate breakdown (DD Form 633) NavCom generated in December 1987 in support of its proposal for the 155 Contract shows that 300 hours were required in connection with CDRL C001, LOR Analysis Report. NavCom engineers who developed the estimate for the proposal described the task being estimated in the Supporting Narrative (DD Form 633 Back-Up Material) as follows:

> A LOR Analysis Report will be generated from LSAR [Logistics Support Analysis Report] compatible data to advise the procuring activity of the results of the *LOR analysis by the contractor*.
>
> The LOR Report will conform to DI-L-2085A . . . .

(Emphasis added) (R4, tab 193) The cost estimate breakdown shows no hours for CDRL C002. We find when NavCom bid the contract, it interpreted the contract to require the contractor, not the Government, to perform LORA.

9-12. NavCom's 16 February 1988 proposal provided:

> 3.7.1 Level of Repair Analysis (LORA)
>
> . . . .
>
> The LORA report will be prepared using DI-L-2085A and delivered 45 days after LORA, as directed by CDRL C001.

(R4, tab 17 at 001358-59)

The 149 Contract LOR Requirements

9-13. The 149 Contract did not call for a LOR Analysis Report. CDRL D002 required a LOR Input Data Report in accordance with DI-L-2155. (R4, tab 1 at 000067) By specifying the submission of a LOR Input Data Report, we find that the Government had chosen the Government LORA performance option for the 149 Contract.

9-14. At a program review meeting held on 21-23 March 1989, NavCom's logistics engineer recommended that the DID DI-L-2085A for CDRL C001 (LORA Report) be changed to DID DI-L-2155 (LOR Input Data Report) (R4, tab 131 at 006396; tr. 18/25). This recommendation would have the effect of changing the Government's selection from a contractor LORA performance option to a Government LORA performance option.

9-15. NavCom advised the Government by letter dated 7 April 1989 that "we will be unable to proceeded on CLIN 0011, CDRL Numbers C001 and C002 due to a conflict in the data item descriptions as defined below:"

> C002 DID UDI-L-22332C requires Government analysis.
> C001 DID DI-L-2085A requires contractor output from the model, or contractor analysis.

The letter went on to say that the contract required the LOR Program Plan (C002) be submitted on 3 June 1989 and, until clarification was received, there would be a day-for-day slip in the schedule. (R4, tab 190; tr. 18/27, 30)

9-16. At the ILS meeting held on 25 April 1989, NavCom again sought clarification on whether performing LOR Analysis was within the scope of its contract. The Government took the position that the contract required NavCom to perform LOR Analysis at "no increase in scope." Having made this decision, NavCom was told that the subject was "closed," and if NavCom disagreed with the decision, to forward its justification. (R4, tab 195 at 006987) We find that, as of 25 April 1989, the Government left no uncertainty that it interpreted the contract to require NavCom to perform the LOR Analysis.

9-17. Undeterred, NavCom's 23 May 1989 letter contended that there was a conflict between CDRL C002 and CDRL C001 on whether the Government or the contractor was to perform the LORA. The letter stated that NavCom was willing to perform LORA using the Government model at an increase in contract price of "approximately $40,000." (R4, tab 191) On 13 June 1989, NavCom wrote the Government and stated that its delay in issuing a contract modification clarifying the LOR Analysis issue was jeopardizing the revised submittal dates (R4, tab 198). By letter dated 27 June 1989, NavCom forwarded a signed copy of a proposed modification to perform LORA and said that "a contract modification is required for us to initiate the work." (R4, tab 199)

9-18. By letter dated 1 August 1989, NavCom submitted its proposal to perform a LOR Analysis. NavCom proposed to submit a LOR Analysis Report (C001) for $39,228 (¶ 5.4.2 of MIL-STD-1390B), and a LOR Plan (C002) for $15,822 (¶ 5.4.1). In addition, NavCom proposed to add CDRL C003, a LORA Status Report, for $5,313 (¶ 5.4.3), and C004, a LOR Summary Report, for $5,508 (¶ 5.4.4). (R4, tab 200) These submissions are required by MIL-STD-1390B when the Government selects the contractor LOR performance option (R4, tab 1001 at 14, 16). The Government did not accept this proposal (tr. 18/96).

9-19. At the 19-21 September 1989 ILS meeting, NavCom still did not consider the question of who was to do the LOR Analysis settled. NavCom again requested guidance. The Government took the same position it had taken since the 25 April 1989 meeting -- that NavCom was required to perform the LOR Analysis, and if NavCom did not agree, to forward its justification and increased costs. (R4, tab 201 at 007037)

9-20. At the ILS meeting held on 23-24 January 1990, the "IMPACT OF DELAYED LORA DECISION" was again raised by NavCom (R4, tab 205 at 007111). Van Cleave testified that by January 1990, NavCom "had heard that the Government was going to give us a contract mod" but nothing materialized (tr. 18/37). After this meeting, Van Cleave believed "We had to do something . . . because we were going no where and we were wasting money" (tr. 18/38). At this point, NavCom decided to do a "mini LORA in a day or so," since LORA "isn't that complicated." NavCom decided to "just simply write down all the assemblies . . . all the prices . . . all the MTBF's [Mean Time Between Failures], write down what we think about the support equipment, and bring it to the Navy and show it to them" (tr. 18/39). The analysis NavCom performed was a scaled-down version of a complete LOR Analysis specified in MIL-STD-1390B.[26]

9-21. NavCom presented its mini-LOR Analysis to the Government at a 9 February 1990 meeting. NavCom sought conditional approval of its mini-LOR Analysis. While the Government was receptive to a contract modification to change the requirement to what NavCom had presented, the Government declined to provide conditional approval and took the position that it must review the information provided, and it would respond in 45 days. (R4, tab 151 at 006629; tr. 18/44-45)

9-22. By letter dated 14 February 1990, NavCom submitted its LOR Analysis Report to satisfy the requirement of CLIN 0011, CDRL C001. The letter stated that the submission was made in accordance with the agreement reached at the 9 February 1990 meeting. NavCom set out the "conditions of the submittal" as follows:

1. The report will be submitted using contractor format.

2. The Government will provide immediate conditional approval, thereby allowing NavCom to proceed.

3. The government will provide final approval within forty-five (45) days of the submittal.

4. Government changes will be limited up to seven (7) ACMs and two (2) digital modules. Any additional changes will result in a day-for-day schedule slip.

NavCom's mini-LORA Report contained this note:

> THIS DATA ITEM HAS NOT BEEN PREPARED IN STRICT ACCORDANCE WITH DATA ITEM DESCRIPTION DI-L-2085A. THIS SUBMITTAL IS PREPARED IN NAVCOM FORMAT PER INSTRUCTIONS PROVIDED DURING NAVAIR LORA CLARIFICATION MEETING (9 FEBRUARY 1990).

NavCom acknowledged what it submitted was its "recommended [LOR] decision." (R4, tab 144; tr. 18/93).

9-23. Since the Government had made clear to NavCom as early as 25 April 1989 that it was NavCom's responsibility to perform the LOR Analysis, we find that the delay in performing the analysis and in finally submitting a report in February 1990 was attributable solely to NavCom's refusal to accept the Government's interpretation.

9-24. By letter dated 20 February 1990, the Government advised NavCom that its LORA Report was "conditionally approved contingent upon the government LORA analysis of the input data." NavCom was told that "[v]alidation of the input will be given in 45 days." The letter also said "[i]f any revisions are necessary, they will be limited to the seven Interface Cable Assemblies and two Digital Circuit Card Assemblies." (R4, tab 145)

9-25. The Government approved NavCom's LOR Analysis Report in accordance with the changes made by the Navy on 30 April 1990. NavCom was paid for the submission of the report. (Tr. 19/30; R4, tab 213)

9-26. On 7 January 1993, NavCom submitted its LOR Program Plan in accordance with CLIN 0011, CDRL C002 (GSR4, tab 1127). NavCom was paid for its submission (tr. 19/36).

9-27. NavCom claims $69,230 for Claim No. 9 for performing LORA (Claim at 450, tr. 18/74).

DECISION

LEVEL OF REPAIR ANALYSIS (LORA) REPORT

In Claim No. 9, NavCom framed the issue as involving a question of contract interpretation: whether NavCom or the Government was required to perform LORA. NavCom argues that "the language of the 155 Contract permits for either the contractor or the [Government] to perform the LORA . . . [and] when read in unison, the 155 Contract, the MIL-STD-1390B (NAVY), the CDRLs and the DIDs sets [sic] forth that the [Government] was to perform LORA" (app. br. at 1, 9).

The contract SOW (¶ 3.7.1) requires NavCom to "establish, implement, and maintain a Level of Repair Analysis (LORA) Program in accordance with MIL-STD-1390B." Under ¶ 6 of MIL-STD-1390B, the Government is given two options. One option is for the contractor to perform LORA "to include input data derivation, analyses performance, and report preparation." The other option is for the contractor to provide input data for the Government to perform LORA. The detail requirements for the contractor LORA performance option are delineated in Section 5 of MIL-STD-1390B; the requirements for the Government LORA performance option are delineated in Section 6 of MIL-STD-1390B.

If the Government chooses to have the contractor perform LORA, ¶ 5.4 (LOR Data Requirements) requires the submission, among others, of a (1) LOR Program Plan, and (2) LOR Analysis Report, in accordance with the corresponding DID and CDRL. If the Government chooses to do the LORA itself, ¶ 6.2 (LOR Data Requirement) requires the submission of a (1) LOR Program Plan (¶ 6.1), and (2) LOR Input Data Report (¶ 6.2.1), also in accordance with the corresponding DID and CDRL.

In this case, even though CDRL C002 did not call for a LOR Input Data Report, it called for a "Plan, Program Level of Repair (LOR) Government Analysis" in accordance with DI-L-22332C. DI-L-22332C states "[t]he plan describes how and when the Level of Repair (LOR) program will be conducted to generate required data *necessary for the Government to perform an LOR analysis*" (emphasis added). Based on the language of DI-L-22332C, we conclude that NavCom could reasonably interpret the contract to require the Government, not the contractor to perform LORA.

Having so concluded, we nonetheless conclude that NavCom cannot recover because it did not rely on the interpretation it now advances in preparing its bid. We have found when it bid the contract, it interpreted the contract to require the contractor, not the Government, to perform LORA. It is well established where a contractor seeks recovery based on its interpretation of an ambiguous contract, it must show that it relied on the

interpretation it advocates. *Fruin-Colnon Corp. v. United States*, 912 F.2d 1426 (Fed. Cir. 1990); *Lear Siegler Management Servs. Corp. v. United States*, 867 F.2d 600, 603 (Fed. Cir. 1989).

CONCLUSION

Because NavCom has failed to show that it relied on the interpretation it advanced at the hearing in preparing its bid, and because it interpreted the contract to require the contractor, not the Government to perform LORA when it bid the contract, we hold NavCom is not entitled to an equitable adustment.

Accordingly, NavCom's appeal in connection with Claim No. 9 is denied.[27]

ASBCA No. 52298 - Claim No. 10
IMPACT OF LORA ON TYPE II TECHNICAL MANUALS
FINDINGS OF FACT

10-1. CLIN Nos. 0013 and 0014 require "Technical Manuals" (R4, tab 15 at 000723). The preparation and delivery requirements for the Technical Manuals are set out in Attachment Four to MIL-T-24664(EC) of the 155 Contract – TECHNICAL MANUAL CONTRACT REQUIREMENT (TMCR), TMCR No. AIR-55532-E1, issued 18 February 1987. The TMCR requires NavCom to develop a Type II, Production Equipment Technical Manual (Type II Technical Manual) "to support the system or equipment being procured under this contract." (R4, tab 15 at 001072-73; tr. 18/7) The Type II Technical Manuals are used by the Government to repair the 155 RTSs (tr. 18/68-69).

10-2. Altogether, 10 Type II Technical Manuals were required. For the "ship side," nine manuals were required, one manual for each of the seven ACMs, one organizational level manual and one combined intermediate and depot level manual. For the "air side," one manual containing organizational and intermediate level tasks was required.[28] (Tr. 18/174-75) The "ship side" of logistics supports the functions of ships such as a destroyer, a cruiser, or an aircraft carrier. The "air side" of logistics supports aircraft such as the F-14s or F-18s, which can be on an aircraft carrier or stationed at an air base. (Tr. 18/105) The contract contains certain milestones for the submission of Type II manuals. These milestones were a series of in-process reviews on the quality and other aspects of the manuals. (Tr. 18/177)

10-3. The Logistics Support Analysis Report (LSAR) is a "very robust, complex" database. This database contains information on how to fault-isolate, remove, replace and repair various RTS parts. (Tr. 18/153-54) The 155 Contract required NavCom to maintain an LSAR (R4, tab 26 at 002171). Sheryl Gottesman, NavCom's ILS program manager, explained the relationship between LORA, LSAR and development of the Type II Technical

Manuals: "You need the LORA to know what goes into the LSAR; you need the LSAR because that is where the procedures are developed; and then that is used as a source data to develop the technical manual" (tr. 18/181).

10-4. Since the LORA is a recommendation to the procuring activity, a LOR decision is "usually made by the government after it gets its recommendation" (tr. 19/55). We find that the contractor has no say as to what goes into the Government's LOR decision. The Government is free to reject a recommendation made by a contractor.

10-5. Van Cleave testified that in September 1989, "when LORA kept getting delayed and delayed and delayed," NavCom laid off the engineer who was working on the LSAR (tr. 18/76-77).

10-6. At the ILS meeting held on 9 February 1990, NavCom reported that the Type II manuals had been submitted for 25% in-process review (IPR). Further technical manual development was on hold because NavCom needed the Government's (1) 25% IPR comments, (2) LORA results, and (3) LSAR developed. (R4, tab 208 at 007164; tr. 18/185)

10-7. Of the 38 parts, NavCom's mini-LORA Report recommended 22 parts for discard, 8 parts for depot repair, 6 parts for intermediate repair, and 1 part for depot or intermediate repair. NavCom provided no recommendation for one part (Enclosure Assembly). (ASR4, tab 633 at 049809)

10-8. The Government sent NavCom by letter dated 28 March 1990 three enclosures which constituted "the government final Level of Repair (LOR) decision." The letter instructed that "[a]ll associated data and documents will reflect the LOR and support this maintenance philosophy." (R4, tab 210; tr. 18/55) Of the 38 parts, the Government's LOR decision classified 2 parts for discard, 29 parts for depot repair, 6 parts for intermediate repair and 1 part for operation/intermediate repair (R4, tab 210 at 007289; tr. 18/94-95). Van Cleave testified that the Government's LOR decision "changed maybe half of everything" (tr. 18/70). In changing 21 items, NavCom alleged the Government went "way, way beyond" the 7 ACM and 2 digital card limitation agreed upon (tr. 18/70). The Government does not deny that Captain Jerratt and Jim Petty agreed to limit changes to the seven ACM and two digital cards. Captain Jerratt was the head of Program Management Activity, and Jim Petty, NAVAIR's program manager, worked for him. (Tr. 18/39-40) Neither of them has been shown to have authority to contractually limit the Government's LOR decision.

10-9. NavCom forwarded its "comments and questions" on the Government's LOR decision by letter dated 30 March 1990. With respect to the LOR decision, the letter said:

> 2. The magnitude of effort implied by Enclosure (3) is well beyond the scope of the conditionally approved agreement on LORA. The delay in resolving the LORA analysis issue puts the first article schedule and production schedule in jeopardy. This decision will therefore result in serious cost and schedule impacts for the entire program. Before we jointly proceed to agree on implementing this decision we would require a contract mod to reflect its impact on the contract schedule.

(R4, tab 211 at 007293; tr. 18/58)

10-10. In reply, the CO's 30 April 1990 letter stated that "[a]lthough the Navy is pleased that NavCom is concerned with the accuracy and validity of the Navy's LOR decision, NavCom's responsibility ends with the submission of C001, LOR analysis report" (R4, tab 212).

10-11. Notwithstanding the CO's 30 April 1990 letter stating that the LOR decision was "a final approved Navy Level of Repair," NavCom wrote again on 15 May 1990, contending that the Government "espoused a different LOR" at the 3-5 April 1990 Integrated Logistics Support Management Team (ILSMT) meeting. NavCom wanted to be advised "if the 'Navy approved LOR' pertains to the total program, or just for the 'ship side.'" If it was for the "ship side" only, NavCom wanted to be provided the LOR for the "air side." (R4, tab 216; tr. 19/32) Apparently, there was a discussion at the 3-5 April 1990 ILSMT meeting at which the "air side" wanted certain items which were designated as depot repairable in the LOR decision to be intermediate repairable instead (tr. 18/167; R4, tab 218 at 007365).

10-12. In response to NavCom's inquiry, the CO's 18 May 1990 letter advised NavCom that the Government's 28 March 1990 letter "provided the final NAVY Level of Repair applicable to the AN/UPM-155 Radar Test Program under contract N00019-88-C-0228." (underscore in original) (R4, tab 217; tr. 18/65). The CO testified that she "wanted to emphasize that the information that we had provided in our letter of 28 March was our final decision" (tr. 19/32). Since what went in the LOR decision was strictly the Government's prerogative, we find any delay implementing the decision was not attributable to the Government.

10-13. At the 17-18 July 1990 ILSMT meeting, NavCom agreed to host a Supportability Working Group Meeting (SWGM). The goal of this meeting was to refine the RTS/ACM LOR decision, and to finalize the single maintenance concept. (R4, tab 220 at 007381). A Tri-Service SWGM was held on 7 August 1990 (GSR4, tab 1288 at 045174). At this meeting, there was a discussion on the Government LOR decision and the "air side" requested LOR on various items (R4, tab 220). After discussion in open session, the Government representatives met privately and decided on a single maintenance concept

for both the "air side" and the "ship side" (tr. 18/171). As reflected in the briefing charts from the meeting, the decisions made at the SWGM impacted the (1) technical manuals, (2) maintainability demonstration, and (3) LSAR. With respect to the LSAR, "ALL ITEMS PREVIOUSLY CODED DEPOT AND NOW CODE INTERMEDIATE OR ORGANIZATIONAL MUST BE REVISED IN LSAR DATABASE" (R4, tab 221 at 007462-63). With respect to the Type II Technical Manuals, the impact included: (1) "Theory of operation and troubleshooting will be to the level necessary to troubleshoot all interfaces of replaceable/repairable components or assemblies," and (2) "Complete illustrated parts breakdown." (R4, tab 221 at 007469)

10-14. By letter dated 11 September 1990, the CO forwarded to NavCom the SWG Documentation Form generated as a result of the 7 August 1990 SWGM to "amplify and clarify" the LOR decision letters of 28 March and 30 April 1990. The letter instructed that the SWG Documentation Form "should be used for all logistics documentation developed under this contract . . . [and] should be used for any further detailed explanation of the maintenance concept and as a basis for the Maintainability Demonstration." (R4, tab 222) Van Cleave testified that the CO's 11 September 1990 letter caused additional work "by a factor of three" (tr. 18/73).

10-15. The parties entered into bilateral Modification No. P00027 on 20 July 1992, 23 months after the 7 August 1990 SWGM. This modification deleted a number of CDRLs (CRDLs E001, E002, F006, F00C and H001 under CLIN 0011, and CRDLs AA12, AA13 and AA14 under CLIN 0012). The total amount of decrease in contract price was $156,216. This decrease in the scope of the contract was offset by the increase in the technical manual and LSAR efforts. The price for the increase in scope for the technical manual (CLIN 0013) and the LSAR efforts (CLIN 0012, CDRLs AA06, AA10) was $156,216. (Gov't Trial Issue Book for Claims 9, 10, ex. P00027)

10-16. As more fully explained in Modification No. P00027, in lieu of the deleted CDRLs, NavCom was to perform the following additional efforts at no increase in contract amount:

> a. The contractor shall incorporate into the TYPE II Technical Manual, Volume 4 circuit level functional descriptions and maintenance schematics; test setups and test procedures; and depot-level specialized maintenance procedures for depot-level repairables as defined at the Supportability Working Group Meeting (SWGM). This effort will reduce the stand-along [sic] documents being referenced in the TYPE II Technical Manual (TRD/TRS) and incorporate all necessary depot-level data into one technical manual, the TYPE II.

> b. As a result of the Tri-Service SWGM held on 7 August 1990, the decisions resulting from that meeting suggested 117 new tasks to be incorporated into the LSAR database. In addition, all "H" records had to be updated to incorporate the Source, Maintenance and Recovery (SMR) code changes. This will provide maintenance and updates to the LSAR database to support further Design Change Notice (DCN) activity through the delivery of the first 501 units. This is a 14 month extension of support, originally scheduled for completion at the Physical Configuration Audit (PCA).

(Gov't Trial Issue Book for Claims 9, 10, ex. P00027)

10-17. The Government contends that "P00[0]27 compensat[ed] NavCom for the changes to the expanded LOR Decision and TYPE II Technical Manuals" (Gov't br. at 175). NavCom provided no evidence on precisely what work that it was required to do as a result of the 7 August 1990 SWGM was not covered by the modification. In the absence of such evidence, we find NavCom was compensated for the changes made at the 7 August 1990 SWGM through bilateral Modification No. P00027.

10-18. The remaining issue in Claim No. 10 relates to Claim No. 7. As discussed in that claim, the interface circuits in the 149 RTS were required by the specification of the 155 Contract to be moved into the ACMs (tr. 7/166-68, 70). NavCom alleged that the 155 specification exempted the ACMs from BIT because the Government thought BIT would add complexity to the ACMs (tr. 8/200). NavCom interpreted the exemption to mean that the ACMs were not to be repaired at the organization level. During the course of the 155 Contract, the Government required organizational level repair of the ACMs. NavCom alleged "[t]he addition of the semi-automatic BIT caused NavCom to rewrite the manuals and redo the LSAR." (App. br., Claim No. 10 at 5, ¶ 32)

10-19. NavCom claims $268,448 for Claim No. 10 (Claim at 455; tr. 18/78).

DECISION

IMPACT OF LORA ON TYPE II TECHNICAL MANUALS

As NavCom puts it, Claim No. 10 involves the question of whether NavCom's increased cost in producing the Type II Technical Manuals resulted from the Government's delay in resolving the LORA conflict (app. br., Claim No. 10 at 1). NavCom's claim is premised on the theory that the Government, not NavCom, was to perform the LORA, and that the Government was to submit the analysis to NavCom. NavCom was then to "use the LORA in completing the Type II tech manuals . . . ." (App. br., Claim No. 10 at 2)

The evidence developed at the hearing shows the following steps are required leading up to a point where a contractor would be in a position to complete the production of the manuals. The LOR Analysis Report is essentially a recommendation to the Government. Once the Government receives the LOR Analysis Report, it has to issue a LOR decision on what parts to discard and what parts to repair at what facility. The Government has the prerogative not to accept the contractor's recommendation. Once the Government issues its LOR decision, the contractor is required to follow that decision in making the necessary changes to the LSAR. The LSAR is a database which contains information on how to fault-isolate, remove, replace and repair various RTS parts. Once the LSAR is in order, then the contractor will have all the source data it needs to complete the manuals.

In this case, NavCom first raised the issue that there was a conflict with respect to whether the Government or the contractor was to perform LORA in a letter dated 7 April 1989. At the ILS meeting held on 25 April 1989, the Government took the position and left no uncertainty that it interpreted the contract to require NavCom to perform the LORA. NavCom persisted in arguing that it was the Government's responsibility from May to August, 1989, even to the point of submitting a proposal to the Government. The Government took the same position in September 1989, as it did in April 1989. Finally, in January 1990, NavCom decided to do a mini-LORA which was a scaled-down version of the complete LORA required by the specification. NavCom submitted this mini-LORA to the Government on 9 February 1990 and requested conditional approval. The Government did not give that approval and wanted time to review. By letter dated 20 February 1990, the Government conditionally approved NavCom's LORA Report "contingent upon the government LORA analysis of the input data." The Government issued its LOR decision on 28 March 1990. When NavCom questioned the LOR decision, the Government advised NavCom by letter dated 30 April 1990 that "NavCom's responsibility ends with the submission of C001, LOR analysis report." NavCom raised additional questions by letter dated 15 May 1990. The CO had to advise NavCom by letter dated 18 May 1990 that the Government had made its final LOR decision on 28 March 1990.

We cannot conclude from the foregoing sequence of events that the Government was in any way responsible for the delay in resolving the LORA conflict. If there was any delay between April 1989 until May 1990, it was due to NavCom's refusal to accept (1) the Government's decision that NavCom, not the Government, was required to perform LORA; and (2) the Government's LOR decision, as to which we have found NavCom had no say.

NavCom also contends that that it is entitled to compensation because the Government's SWGM LOR direction "significantly changed level of repair assumptions" and caused NavCom to rework the Type II Technical Manuals (Claim at 451).

The evidence shows the Government decided on a single maintenance concept for both the "air side" and the "ship side" at the 7 August 1990 SWGM. The decision reached at this meeting was reflected in a SWG Documentation Form which the CO forwarded to

NavCom by letter dated 11 September 1990. The parties subsequently entered into bilateral Modification No. P00027 which paid for an increase in the technical manual and LSAR efforts that came out of the SWGM. As reflected in Modification No. P00027, it covered 117 new tasks to be incorporated into the LSAR database. The Government has taken the position that this modification paid for the expanded LOR decision and the Type II Technical Manuals. NavCom has provided no evidence on precisely what work that it was required to do as a result of the 7 August 1990 SWGM was not covered by Modification No. P00027. In the absence of such evidence, we have found that NavCom was compensated for the changes made at the 7 August 1990 SWGM through bilateral Modification No. P00027.

On the question of whether NavCom is entitled to an equitable adjustment for being required to rewrite the manuals and redo the LSAR when the Government determined that the ACMs were not exempt from BIT, the Government framed the issue as follows:

> If the Board finds in favor of the Government on Issue 7, related to the ICA/ACM semi-automatic BIT, then it should also find that [NavCom] is not entitled to compensation for incorporating a semi-automatic BIT routine into its Type II Technical Manuals. If NavCom was required to fault-isolate ICA/ACMs, it follows that it would also be required to incorporate the methodology in the Type II technical Manuals. Similarly, if the Board finds in favor of [NavCom] on Issue 7, then [NavCom] should be compensated for the work it did to incorporate a fault-isolation technique into the Type II Technical Manual.

(Gov't br. at 300)

On Claim No. 7, we concluded:

> . . . NavCom's interpretation that the ACMs were exempt from all forms of BIT cannot be harmonized with the maintainability demonstration provisions of the specification which continued to refer to the use of "BIT or diagnostics." NavCom's interpretation would render such references meaningless and superfluous.

Following our conclusion, we held that "[b]ecause the ACMs were not exempt from the fault detection and maintenance time (maintainability) requirements of the contract, and because NavCom furnished no more than what the contract called for through a semi-automatic approach short of automatic BIT from which it was exempt, we hold that NavCom is not entitled to an equitable adjustment for Claim No. 7." We conclude

therefore, that NavCom was required to rewrite its manuals and redo its LSAR to incorporate the ACM fault-isolation methodology into the Type II manuals.

CONCLUSION

Because the delay in the production of the Type II Technical Manuals was due to NavCom's refusal to accept the Government's decision that NavCom was responsible for performing the LORA, and to NavCom's refusal to accept the LOR decision, we hold that NavCom is not entitled to an equitable adjustment for the delay costs experienced.

Because NavCom has failed to prove what work it was required to do as a result of the 7 August 1990 SWGM was not covered by bilateral Modification No. P00027, we hold that NavCom is not entitled to an equitable adjustment.

Because NavCom was not exempt from all forms of BIT in its ACMs, and because NavCom furnished a semi-automatic approach short of automatic BIT, we hold NavCom is not entitled to an equitable adjustment for its efforts in incorporating the fault-detection methodology of the ACMs into the Type II Technical Manuals.

Accordingly, NavCom's appeal in connection with Claim No. 10 is denied.

SUMMARY

We deny all of the appeals.

Dated: 25 July 2001

PETER D. TING
Administrative Judge
Armed Services Board
of Contract Appeals

I concur

I concur

MARK N. STEMPLER
Administrative Judge
Acting Chairman
Armed Services Board
of Contract Appeals

EUNICE W. THOMAS
Administrative Judge
Vice Chairman
Armed Services Board
of Contract Appeals

NOTES

[1] All 13 claims were initially docketed under ASBCA No. 50767. Shortly before the hearing, the Board directed the parties to group the claims so that they could be managed in the most efficient manner possible. Thereafter, the claims were grouped and heard in the sequence proposed by NavCom, consistent with its overall burden of proof. After the hearing, the Board divided ASBCA No. 50767 into 7 dockets for purposes of briefing and decision: ASBCA No. 52292 (Claim Nos. 2 and 6), ASBCA No. 52293 (Claim Nos. 1, 3 and 7), ASBCA No. 52294 (Claim No. 4), ASBCA No. 52295 (Claim Nos. 5 and 8), ASBCA No. 52296 (Claim Nos. 11 and 13), ASBCA No. 52297 (Claim No. 12), and ASBCA No. 52298 (Claim Nos. 9 and 10).

[2] The record on these appeals is extensive. The Government's original Rule 4 file consists of 19 volumes. Volume 1 consists of tabs 1-20. Volume 2 consists of tabs 1-11. Volumes 3 through 19 consist of NavCom's claim, Exhibit Nos. 1-550. During the hearing, references were made to NavCom's claim exhibits as Rule 4 tabs. Inasmuch as the tabs in Volumes 1 and 2 were not used, citation in this decision to the exhibits in Volumes 3-19 will appear as R4, tab 1, etc. NavCom supplemented the Rule 4 file with 9 additional volumes, tabs 551-870. They are referred to herein as "ASR4" tabs. Just before the hearing, the Government supplemented its original Rule 4 file with 7 volumes, tabs 1001-1318. They are referred to herein as "GSR4" tabs. The various claims in the appeal were grouped for purposes of the hearing. Each group was heard to its conclusion before the next group. Witness books containing R4, ASR4 and GSR4 tabs pertinent to the testimony given were used. Tabs in the witness books were duplicates of the tabs in the R4, ASR4 and GSR4 files. The Government's hearing exhibits were marked G-5000, etc.; NavCom's hearing exhibits were marked A-6000, etc.

[3] The contractor was originally a division - NavCom Systems Division - of Gould, Inc. At some point Gould decided to divest itself of its defense business. The management team at NavCom Systems Division purchased the division from Gould

and set up NavCom Defense Electronics, Inc., in November 1988 (tr. 3/48, 4/70). For ease of reference, both entities shall be referred to as NavCom.

[4] During the course of events which were the subject of this appeal, the Naval Electronics Systems Engineering Command (NAVELEX) changed its name to the Space and Naval Warfare Systems Command (SPAWAR). SPAWAR subsequently transferred all of its IFF programs to NAVAIR (tr. 4/144-45).

[5] Special Provision M-1, WAIVER AND APPROVAL OF FIRST ARTICLE TESTING AND APPROVAL (APR 1985), NAVAIR 52.209-9502, provides, in part:

> (a) As used herein, the term "first article" means preproduction models, initial production samples, test samples, first lots, pilot lots, and pilot models; and the term "first article testing" means testing and evaluating the first article for conformance with specified contract requirements before or in the initial stage of production; . . . .
>
> (b) When supplies identical or similar to those called for in the Schedule have previously been furnished by offeror/quoter and have been accepted by the Government, the requirement for first article testing and approval may be waived by the Government. . . .
>
> . . . .
>
> (c) The Government reserves the right, exercisable at its sole discretion, to make an award excluding first article testing and approval. . . .

(R4, tab 15 at 12-1)

[6] MIL-T-28800 is the applicable generic test specification that laid out the test procedures and equipment for both the 149 and the production contracts (tr. 2/94-95, 166).

[7] The first digit of the paragraph numbers designates the claim number.

[8] There are 1000 KHz to a MHz. Thus, 0.02 percent of 1000 MHz is 0.2 MHz or 200 KHz. Where ±10 KHz would apply would be at the low end of the frequency range. Thus, 0.02 percent of 12 MHz would be 2.4 KHz. In that case, the accuracy

requirement would be ± 10 KHz because 10 KHz is greater than 2.4 KHz. (Tr. 10/13-14)

[9] Decibel is a term used by engineers to describe power ratios (tr. 12/11). The 155 specification relaxed the accuracy requirement from ± 10% to ± 0.5 dB, which is "about 12 percent" (tr. 12/15).

[10] Linear interpolation means "drawing a line in-between the two data points" (tr. 12/139).

[11] "Open architecture" means placing unshielded subassemblies inside the module (tr. 13/34-35). By virtue of the fact that each module of the 149 EDM had its own housing, the 149 modules were better shielded than the 155 modules (tr. 13/37-38).

[12] dBm specifies power level. It is a logarithmic measurement. The higher the dBm, the stronger the signal. (Tr. 13/75) In this case, 0 dBm is the strongest signal, and -95 dBm the weakest (tr. 12/181, 205).

[13] "Maximum coupling" means the worst case scenario. It means if the MAIN output channel is set at 0 dBm, the AUX output channel is set at -95 dBm, and vice versa (tr. 12/80-81).

[14] Forty five days after contract award is 20 March 1989. See finding 13-5.

[15] * designates substitutions.

[16] This piece of GFE was not listed as a part of the GFE required to be furnished under Special Provision H-14. The record is not clear as to why it was considered GFE.

[17] Apparently, two pieces of GFE were furnished to satisfy KY-532A/ASQ originally designated to be furnished.

[18] The "architecture" of the ACM refers to the number of control lines needed for the interrogators and the transponders (tr. 14/26).

[19] "Design characteristics" refer to the signal parameters for each of the controls and response signals to and from the UUTs (tr. 14/26).

[20] Category 1 - Defective Specifications and or Superior Knowledge (¶¶ 1-1 to 1-7); Category 2 - Erroneous Specifications Which Were Missing or Silent (¶¶ 2-1 to

2-5); Category 3 - Defective Specifications for Unneeded Requirements (¶¶ 3-1 to 3-7); and Category 4 - Defective Specifications for Needed Requirements (¶¶ 4-1 to 4-11). (Claim at 457-500)

[21] We do not necessarily agree with NavCom's characterization of the issues involved. We nonetheless use this and other NavCom headings in Claim No. 11 so that tracking of the 30 sub-claims is less confusing.

[22] NavCom mistakenly designated this sub-claim as 4-3 also.

[23] We reversed the CO's determination on sub-claims 3-1, 3-2, and 3-5, and sustain the CO's determination on sub-claims 2-3, 3-6, 3-7, and 3-11.

[24] Actually, there were 30 alleged errors NavCom identified. It designated two sub-claims as 4-3. We have designated the second one as 4-4.

[25] The software on the 149 RTS was programmed in Z-80 assembly language which was the machine code or instruction set for the Z-80 processor. Software programmed in "high order" language such as PASCAL or FORTRAN had to be compiled down to work with the Z-80 assembly language. (Tr. 17/48)

[26] MIL-STD-1390B provides that "[t]he analysis is based on applicable operational factors such as operating hours and baseloading values; support factors such as maintenance action rates, maintenance times and maintenance costs; and non-economic factors" (GSR4, tab 1001 at ¶ 4.1.1).

[27] The CO found partial entitlement on Claim No. 9 in the amount of $39,213 in her 18 February 1997 letter (ASR4, tabs 669, 734). By the time the hearing took place, the CO had apparently changed her mind. Once appealed, the CO's determination does not affect our decision one way or the other. *Wilner*, 24 F.3d at 1402.

[28] The "air side" manual was subsequently deleted by a contract modification (tr. 18/183, 19/49).

I certify that the foregoing is a true copy of the Opinion and Decision of the Armed Services Board of Contract Appeals in ASBCA Nos. 50767, 52292, 52293, 52294, 52295,

52296, 52297, 52298, Appeals of NavCom Defense Electronics, Inc., rendered in conformance with the Board's Charter.

Dated:

EDWARD S. ADAMKEWICZ
Recorder, Armed Services
Board of Contract Appeals