ARMED SERVICES BOARD OF CONTRACT APPEALS

Appeals of --	)	
	)	
Derm/Buro, Inc.	)	ASBCA Nos. 54959, 54960, 54961
	)	
Under Contract Nos. SP0100-04-D-4031	)	
SP0100-00-D-4027	)	

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APPEARANCES FOR THE GOVERNMENT:	Michael L. McGlinchey, Esq. Chief Trial Attorney Kathleen D. Hallam, Esq. Trial Attorney Defense Supply Center Philadelphia (DLA)

OPINION BY ADMINISTRATIVE JUDGE PEACOCK

These appeals involve claims for equitable adjustments related to a "coloration change" to the pigmentation of clothing fibers manufactured by the sole source supplier of the fibers. The fibers were the "building blocks" used to produce fabric and "high performance" anti-gravity suits worn by military aviators. The "coloration change" was requested, approved and authorized by the government during performance of the referenced manufacturing contracts. No prior testing was performed by the government to determine the effects on the performance characteristics of the fabric or end item suits supplied under the contracts. In requiring use of the proprietary new fiber, the government also changed the spectral reflectance requirements of the specification. Initially, the change was constructively made to the specifications of both captioned contracts. The government subsequently modified the later-awarded contract to expressly incorporate the revised requirements. We conclude herein that the "coloration change" caused the suits to fail endurance testing and that appellant is entitled to an equitable adjustment to compensate it for the increased time and cost of performance under both contracts. Accordingly, we sustain ASBCA Nos. 54959 and 54960. We also find that the claim in ASBCA No. 54961 is effectively subsumed within, and linked to, the same causative chain of events considered and resolved in the two earlier-numbered appeals. Accordingly, we dismiss ASBCA No. 54961 as duplicative.

FINDINGS OF FACT

Contract 4027 and Background

1. The Defense Logistics Agency, Defense Supply Center Philadelphia (DSCP or government) awarded Contract No. SPO100-00-D-4027 (Contract 4027) to Derm/Buro, Inc. (DB, Derm/Buro, or appellant) effective 28 June 2000 for the supply of "CSU-13B/P Anti-G garments" (hereinafter suits or anti-G suits). Contract 4027 is an indefinite quantity, firm fixed price contract with a minimum quantity of 6,025 and a maximum quantity of 11,190 suits to be delivered during the base year and each of two option years. (R4, tab 13) No first article was required. DSCP exercised both options and issued four delivery orders (DO) for a total of 33,570 suits. As extended, the final delivery date for the second option year was 26 November 2003. Clauses incorporated into the contract included: FAR 52.243-1, CHANGES-FIXED PRICE (AUG 1987); FAR 52.233-1, DISPUTES (DEC 1998); FAR 52.249-8, DEFAULT (FIXED PRICE SUPPLY AND SERVICE (APR 1984); FAR 52.249-2 TERMINATION FOR CONVENIENCE OF THE GOVERNMENT (FIXED PRICE) (SEP 1996); and FAR 52.242-17, GOVERNMENT DELAY OF WORK (APR 1984) (R4, tabs 8, 18, 22, 23, 32, 38, 39).

2. To manufacture the anti-G suit, a contractor must be qualified and be placed on the "Qualified Producers List" (QPL). Prior to DB, Light Industries of Patterson, New Jersey was the primary supplier of the anti-G suit to the government for 18-20 years (tr. 1/28-29). When Light Industries went out of business in 1991-1992, DB hired its key personnel and became a qualified producer of the anti-G suit in 1993 (tr. 1/26-29, 34[1]).

3. Appellant has manufacturing facilities in Hialeah, Florida and another approximately 200 miles away in Clearwater, Florida. The Hialeah facility cuts fabric for the suits. The facility in Clearwater is dedicated 100% to the suits and performs all operations except cutting, including those required to manufacture the bladder. Mr. Frank Guthart is the president of the company. (Tr. 1/37, 45-47, 6/44)

4. In late 1993 or early 1994, Derm/Buro began performance under the first of eight contracts for supply of the anti-G suit to the United States Air Force (AF). Derm/Buro provided between 25,000 to 28,000 anti-G suits to the AF under contracts prior to Contract 4027. None of the suits failed or were rejected and no problems with quality were reported from the field. The anti-G garments supplied by Derm/Buro to the AF under previous contracts were manufactured pursuant to the specification

[1] The hearing of these appeals was conducted over a seven day period commencing on 11 April 2007 and ending on 19 April 2007, excluding the weekend. Transcript citations reference the hearing days in chronological order. For example, Day 1 of the hearing on 11 April is cited herein as Tr. 1/ (followed by the appropriate page number) and Day 5 of the hearing (17 April 2007) is referenced as Tr. 5/.

incorporated in both captioned contracts. (Tr. 1/31-37, 4/127-28; app. R4, tab 263; R4, tab 1)

5. Contract 4027 was the first contract for anti-G suits awarded to Derm/Buro by DSCP. Under both of the captioned contracts, DSCP's customers or users of the suits were the United States Navy (Navy) and AF. The suits were required to be manufactured pursuant to the same AF specification as prior contracts and the AF was the "Engineering Source Authority" responsible for ultimate resolution of technical issues. However, DSCP received technical assistance and testing support from both the AF and Navy. (Tr. 2/22-24, 4/36, 165, 176-79)

Suit Components and Manufacturing Generally

6. The suit is a pant-like garment resembling "chaps." It is worn by aviators to protect them against adverse physiological effects caused by exposure to centrifugal forces during aircraft maneuvers exceeding the force of gravity (G forces). The suit extends from the waist to the calves of the wearer and fits snugly around the abdomen and legs. (R4, tab 1 at 9, tab 123; tr. 5/251)

7. There are two primary components to the suit: an outer shell or casing and an inner bladder (tr. 1/154, 6/135; R4, tab 1 at 9). A hose leads from the suit to an air regulator system in the cockpit (R4, tab 1 at 9; tr. 5/252, 257-58). A small valve on the regulator senses the acceleration of the aircraft (tr. 5/258). As G forces are encountered during aircraft maneuvers, the bladder inflates with pressurized air from the aircraft proportional to the G forces. The inflated suit tightens around the person's lower abdomen and legs. This counteracts pooling of blood in the lower torso and legs by squeezing the blood up to the head. Once the G force passes, the suit deflates. Failure of the suit can result in gravity-induced loss of consciousness, or otherwise interfere with the pilot's ability to control the aircraft. (R4, tab 123 at 2)

8. The suits were to be manufactured in accordance with Military Specification Mil-A-83406B USAF, Amendment No. 4, dated 16 November 1998, with certain Interim Changes (R4, tab 7 at 10, tab 40 at 9). Manufacturing of the shell's base cloth (aramid) (formally called "Cloth, Plan and Basket Weave, Aramid") under the referenced contracts was governed by Military Specification MIL-C-83429B, Interim Amendment No. 2, dated 26 May 1993 (R4, tabs 1, 2, 7 at 10, tab 29, 40 at 24). The latter specification requires that the aramid fiber blend consist of "92 percent meta-aramid fiber, 5 percent para-aramid fiber, and 3 percent conductive fiber" (R4, tab 2, ¶ 3.3.1). E.I. DuPont de Nemours & Company, Inc. (DuPont) is the sole source manufacturer of the meta-aramid fiber used to make the aramid cloth. DuPont's trade name for the fiber is Nomex and the manufacturing process is proprietary to DuPont (R4, tab 3 at 1; tr. 1/56, 3/28-30, 4/56, 122-23, 5/26-27). There is no contention and no evidence that any other producer was capable of producing the fiber required.

9. Nomex fibers are inherently flame-resistant but unlike some other flame-resistant materials, Nomex has textile-like characteristics that allow it to be processed into a cloth on conventional textile equipment (R4, tab 3 at 1). There are a number of types of Nomex available; each is designed for a different end item use (R4, tab 3 at 1). Military grade Nomex is producer-colored rather than piece-dyed (R4, tab 4 at 2). Producer-colored fibers have colorants incorporated during the fiber manufacturing process. These fibers have a high crystallinity and higher yarn and fabric strength when compared to piece-dyed products. Producer-colored fibers provide more consistent coloration than piece dying and also have greater tenacity because the yarn is fully crystallized when it leaves DuPont. (R4, tab 4 at 2; tr. 3/25-26, 5/164) Generally, greater tensile strength translates into greater fabric breaking strength (app. R4, tab 51 at 2).

10. The type of Nomex used for the shell was originally comprised of 95% Nomex and 5% Kevlar fibers (R4, tab 2 at 4, ¶ 3.3.1). In 1992, DuPont changed the fiber blend to incorporate P140, a conductive nylon sheathed carbon-black fiber that reduced static, thereby eliminating the need for the application of an anti-static finish (R4, tab 2 at 3, tab 4 at 1; app. R4, tab 83 at 1). The cloth specification was changed to reflect this revised blend of 95% Nomex, 3% P140, and 2% Kevlar. The weight of the cloth could vary within a range of 4.3 to 5.0 ounces per square yard.[2] (R4, tab 2 at 7, ¶3.7, 26, ¶ 3.3.1; app. R4, tab 82 at 1)

11. The fabric or cloth manufacturer is responsible for converting the DuPont Nomex fibers into cloth. In this case, appellant's initial fabric supplier, Milliken Co. (Milliken) purchased the fibers from DuPont and then engaged a third party to spin the fibers into thread or yarn. The thread/yarn then was delivered to Milliken which wove it into cloth. After completing the weaving process, Milliken was responsible for performing a series of tests on each lot of cloth, such as dimensional stability, weight, tear strength, flammability, etc. The cloth was then sold to appellant in rolls. The Nomex fabric was shipped from Milliken to Derm/Buro with the manufacturer's test reports and a Certificate of Conformance showing that it met the specifications. The contract does not specify that the fabric should be subjected to tests to determine its ability to resist abrasion. The referenced contracts identified Milliken as the approved source for the cloth. (Tr. 1/45-50, 71-72, 143, 4/136-37; R4, tab 3 at 12).

12. The bladder within the aramid/Nomex shell covers the abdomen, and the front of the legs (tr.1/154). It is constructed of polyurethane coated nylon cloth (R4, tab 1, ¶ 3.4.1.2 at 3, 71, 76, 87; tr. 1/154). The weight of the coated nylon cloth is required to be between 5.5 to 6.5 ounces per square yard[3] (R4, tab 377 at 18, Table III, column

[2] Subsequent references herein to the weight of the cloth are to ounces per square yard.
[3] Subsequent references to bladder weight are to ounces per square yard.

"Type 1"). Bladders, like the shells, are sized from small regular to large extra long. Each bladder size has its own drawing/pattern (tr. 5/112; R4, tab 383).

13. Derm/Buro purchased the bladder material from Lamcotec. The bladder material used was a polyurethane coated nylon fabric identified in the specifications. Lamcotec provided Derm/Buro with vendor reports from Lamcotec which indicated the weight and the other characteristics of the bladder material shipped to Derm/Buro and certified that the material met the specifications (app. R4, tab 314 at 43-47; tr. 1/152-54).

14. Upon receipt of the fabric from Milliken, Derm/Buro spread the fabric and performed a hand examination and inspection of the fabric before it was used. The government supplies Derm/Buro with patterns which DB was required to use for cutting the fabric. (Tr. 1/50-51, 2/277-81)

Inspection and Testing

15. After manufacture, the suits were subject to a visual and dimensional examination and to performance testing prior to acceptance by the government. Approximately 40 suits from each lot were visually inspected by appellant and government inspectors for dimensional, sewing and other manufacturing defects. Appellant's materials (including bladders), pattern cutting, sewing and other manufacturing operations were inspected periodically, and in particular, after lot failures. (Tr. 1/53-54, 124, 2/128, 6/22, 47-53, 65)

16. The performance testing regimen consists of pre-endurance leakage tests, endurance tests and post endurance tests. Each of these tests is designed to insure that the bladder functions properly during G force maneuvers. The performance testing is required under the specifications in the referenced contracts to be performed on an inanimate model consisting of three discrete parts representing two legs and one torso. Two models, one small and one large, are required. The models are generally made of wood and/or fiberglass and coated with epoxy. The suits in sizes small regular and small long are fitted to the small model, and other sizes to be tested are fitted on the large model. (R4, tab 1 at 46, 53; tr. 1/53-54) The specification contains requirements, including shape and dimensions, for the inanimate models (R4, tab 1 at 53-54, 67). The government has inspected and measured Derm/Buro's inanimate models and found them to be in conformance with the specifications. DB has used the same type of inanimate models for destructive endurance testing of anti-G suits since 1993, including performance under the referenced contracts. (Tr. 1/55-59)

17. The sole garment manufactured for military applications using Nomex that is endurance-tested is the anti-G suit. The first performance test that is performed is the pre-endurance leakage test. Leakage testing involves inflating the bladder to 12 pounds per square inch (psi) and maintaining that pressure for 60 seconds. While the suit is still

inflated, it is examined for material and manufacturing defects. If a defect is found, the suit is rejected. The suit is then subjected to the endurance test. With the suit fitted to the model, it is inflated 1000 times to a pressure of 15 psi and then examined for defects. The suit then undergoes the post endurance leakage test which is the same as the pre-endurance test. (R4, tab 1 at 50; tr. 1/60, 4/104)

18. For testing, government representatives select two suits at random from Derm/Buro's production lot. The two randomly-selected suits used during testing are stamped "Endurance tested not to be used in flight" and are later sent to DSCP. (R4, tab 1; tr. 1/53-54, 60)

19. If one of the suits fails the endurance or leakage test, acceptance of all items in the lot is withheld pending investigation of the extent and cause of the failure. The contractor is required to explain the cause of the failure, the corrective action the contractor intends to take to preclude recurrences, and the impact the failure may have on delivery. Before the contractor can resubmit the failed lot for retesting, it must obtain approval of its corrective action plan from the AF. The Navy also used the suit, but as the lead service, the AF made the final decision on technical issues. (R4, tab 1 at 44; tr. 4/9-10, 90-91, 177, 179, 185, 210, 6/130)

20. During endurance testing, the suit is connected to a special machine equipped with a series of calibrated gauges and counters. Derm/Buro performed the destructive endurance testing using the same machine throughout performance under the referenced contracts, and prior thereto, without change. (Tr. 1/60, 111-15; app. R4, tab 321) There is no persuasive evidence that the fiber, fabric or suits failed to satisfy material specification requirements that may have contributed to the failures and deficiencies except as mentioned herein (tr. 4/148, 170-71).

Initial Performance and the Coloration Change

21. Derm/Buro timely performed and completed the base year of Contract 4027 without a failure (tr. 1/69-70).

22. On 18 June 2001, DSCP exercised DO No. 2 (DO 2) (first option period) to Derm/Buro. Derm/Buro successfully completed DO 2, making all deliveries in a timely manner. (Tr. 1/75-76; R4, tab 32)

23. A negative consequence of the 1992 change in fiber blend (finding 10) was that the carbon black caused the resultant fabric to fail specification requirements for near-infrared reflectance ("NIR") relating to the visibility of the fabric at night (app. R4, tab 82 at 1). As a result, the pertinent NIR requirements for the suits produced under the referenced contracts were deleted from the specification (Interim Amendment No. 2). The combinations of dyes/pigments used in extruding or manufacturing the fibers impart

the NIR qualities. Between 1992 and 2002 at the urging of the military, DuPont continued its experimental development of fibers that would satisfy the NIR requirements. (Ex. G-2 at 2; tr. 3/29-37, 4/113-14, 117-18, 5/164)

24. In March 2002, DuPont notified DSCP that it had developed a coloration change to the Nomex fiber which would allow the aramid cloth to meet the previously-deleted NIR requirements "in line with other military items" (app. R4, tabs 16, 19). The notification was also sent to Milliken and other weavers, spinners and various garment manufacturers but not appellant (app. R4, tab 19; tr. 1/145-146). According to DuPont, the coloration change did not alter the final shade of the cloth (app. R4, tab 19). DuPont intended to begin production of the changed Nomex in March 2002 but continued its experimentation and refinement of the formulae for the fiber. It did not deliver post-change fiber to manufacturers until an indeterminate but substantially later date. We are unable to determine the precise date when DuPont began supplying the new fibers to fabric manufacturers. DCSP advised Milliken of the change in a Memorandum dated 1 March 2002. (App. R4, tab 19; R4, tab 90 at 3; tr. 4/119-20) On 1 April 2003, Milliken was directly advised of implementation of the change by DuPont (app. R4, tab 25). Post-change fabric was not used in the manufacture of the suits by DB prior to its production of Lot 46 manufactured in approximately mid-2003 during the final option year (tr. 5/121-22, 146; R4, tab 136).

25. DuPont performed a series of fiber tenacity tests over a period of 14 months to determine if the change in formulation significantly altered the characteristics of the fiber. DuPont performed tenacity tests on the pre-change fibers between 28 June 2001 and 30 December 2001 and tenacity tests on post-change fibers between 6 February 2002 and 2 August 2002. DuPont determined that there was no significant difference between the mean tenacity results for the pre- and post-change fiber. (Tr. 7/316-317; R4, tab 382)

26. In March 2002, DSCP's cognizant "Product Service Manager" for the aramid cloth involved in this dispute notified various weavers, spinners, dyers, and contractors including Milliken (but not appellant) that DuPont was making a proprietary "coloration change" in its Nomex fiber (app. R4, tab 19). Only DuPont was knowledgeable of the precise alterations of the dye chemistry involved in the "coloration change" (app. R4, tab 51). DSCP stated in the notice (app. R4, tab 19):

> Dupont Advanced Fiber Systems has notified SCP that a coloration change has taken place in regards to the aramid blend fibers which construct the MIL-C-83429B Cloth. This change will not affect the final shade of the cloth, but does register a NIR signature in line with other military items, Dupont will begin production of this change in March of 2002.

27. The government was aware of DuPont's ongoing research and approved use of the changed fiber in manufacturing the cloth and suits (app. R4, tab 26A). There is no evidence (or contention) that either the change in the fiber, or use of the fiber in producing the cloth and suits, was not approved by authorized government personnel. No pre-change tests or analyses were conducted by DSCP, the AF or the Navy to determine the effects of the "coloration change" on the fabric or anti-G suits manufactured using the fibers, and in particular to assess the comparative ability of the suits to withstand endurance testing (tr. 4/108-09, 140-42, 7/74, 296).

28. On 13 June 2002, DSCP issued DO 3 for an additional 6,025 anti G-Suits to be delivered over the period 29 December 2002 through 29 June 2003 (tr. 1/76-77; R4, tab 38).

29. On 17 October 2002, DSCP issued DO 4 (the final delivery order issued under Contract 4027) for an additional 5,165 anti-G suits to be delivered during the period 29 June 2003 to 26 November 2003 (R4, tab 39; tr. 1/77-78).

The Lot 37 Failure

30. All suits passed testing and were accepted under Contract 4027 until 30 October 2002, when appellant's production Lot 37 was presented for end item inspection. Government personnel in attendance during the inspection of Lot 37 included the Government Quality Assurance Representative (QAR) assigned to appellant's facilities. As was the practice during end item inspection, the QAR selected the two suits that were subjected to endurance testing. Appellant's personnel fitted the suits to the models and hooked up the hoses to the testing equipment. (Tr. 5/41-45)

31. During the endurance testing one sample suit failed. A tear occurred in the lower abdominal area. (R4, tabs 63, 64, 183; tr. 1/80, 5/40, 46)

32. As a result of that failure, the entire lot was rejected, and a Corrective Action Request ("CAR") was issued (app. R4, tab 24 at 2). Before the lot could be resubmitted, appellant was required to perform a 100% inspection and provide a response to the CAR notifying the government of the probable cause of the failure and the action appellant would take to preclude a recurrence (*id.*). The probable cause of the failure was roughness, spurs or imperfections on the exterior surface of the wooden model used in the endurance testing. The type of tearing was distinguishable from the ruptures experienced later and detailed below. (Tr. 1/263-64, 2/265-66, 4/214, 6/100-01, 7/179-83; R4, tab 139) Appellant provided its response to the CAR on 7 November 2002. Appellant advised that it would have the model resurfaced to eliminate cracks, spurs and surface imperfections and that it had ordered an additional model. To ensure that the failure would not occur in the future, appellant planned to inspect its models on a monthly basis. Appellant's response was forwarded to the AF for approval. (R4, tab 65)

33. The Lot 37 failure was the first failure of any type experienced by appellant. The government contemporaneously agreed with appellant's explanation of the failure (tr. 5/46, 76; app. R4, tab 24 at 1). Lot 37 was rescreened, re-inspected (as Lot 37A) and ultimately accepted 2 November 2002 (R4, tab 182).

Lots 53 Through 56

34. On 7 August 2003, Lots 53 and 54 were presented for end item testing. Lot 53 failed and Lot 54 passed. The suit from Lot 53 that failed was size medium-regular. The aramid fabric in the abdominal region of the suit ruptured during endurance testing. The fabric rupture on Lot 53 started approximately 1-1/2 inches above the sewn-in bladder tab of the garment and extended approximately six to seven inches. (R4, tabs 66, 78; tr. 1/77-80, 109-10). The rupture was the first experienced by appellant (tr. 4/129). At the time of the Lot 53 failure, appellant had timely delivered from 500 to as many as 1200 suits per month for a total of approximately 32,000 under Contract 4027 (tr. 1/86, 114).

35. By letter dated 13 August 2003, Derm/Buro advised the government in part as follows regarding the fabric rupture that occurred on Lot 53 during destructive endurance testing (R4, tab 67):

> A. Root cause of each deficiency
>
> 1. Material specification verified and COC ["Certificate of Conformance"] available for inspection.
>
> 2. Garment visual and stitch count inspection. Stitch count within 10-12 inches per inch as per specification. No other defects found.
>
> 3. All sewing operations reviewed and found to be in compliance with specifications.
>
> 4. Garment disassembled and all sewing components checked against patterns. No deficiency found.
>
> 5. Derm/Buro quality control procedures reviewed and found in compliance with Mil-I-45208 as required.
>
> 6. Small Regular garment (Lot #53) serial number 130451 endurance tested at the same time. No failure after 780 cycles.

7. Medium regular garment serial number 130201 selected for Lot #54 manufactured at the same time passed the endurance test of 1,000 cycles.

Conclusion: Derm/Buro could not discover any deficiencies in components, manufacturing or quality control procedures and can only surmise the above was a production anomaly.

….

C. Action taken to correct and prevent recurrence of the root cause of the deficiency.

1. Derm/Buro will perform a 100% visual inspection of all CSU-13 B/P Anti-G Garments and its components.

….

E. Action taken to correct the weakness, which allowed deficient product to be presented to the Government for acceptance.

1. Production management and supervisors to review all sewing operations that could affect area of deficiency. Quality Control inspectors to add additional visual and stitch inspection in area of deficiency.

2. Lot number 53 to be 100% visually inspected and all sewing specifications in area of deficiency to be reexamined.

3. 100% - 2 minute leakage test to be performed. (Serial No.'s will be available for inspection).

4. The above actions will be a 100% screening and re-inspection. All defects found will be recorded and corrected.

F. Target dates for implementation of identified corrective action.

> 1. Derm/Buro will require 5-7 business days after Governments [sic] approval to complete correction and submit Lot #53 for endurance testing and acceptance. Corrective action has commenced as of August 11, 2003.

36. On 21 August 2003, contracting officer Dan Price sent a letter to Derm/Buro requesting that Derm/Buro send fabric and/or anti-G suits from Lot 53 to Mr. Le Huyen at Brooks Air Force Base in Texas for inspection and examination to ensure compliance with the government's specifications. (R4, tab 68). Mr. Huyen was the cognizant engineer and technical representative for the AF during Derm/Buro's performance of these contracts. He had also been the AF engineer on DB's prior contracts to manufacture the suits since approximately 1993, during which time he attended many destructive endurance tests at appellant's facilities. (Tr. 1/95-96, 7/67)

37. On 28 August 2003, production lots 55 and 56 were inspected; both lots failed. The Lot 55 sample (size small-long) failed the post-leakage test for failure to hold the minimum pressure required by the specification. The inspection team discovered that the hose assembly used to conduct this test had a ¾ inch bond seam separation and attributed the test failure to that defect. The hose assembly is part of the end item and appellant is responsible for defects found in that component. (R4, tabs 72, 100; tr. 5/48-49) The defect was not related to the "coloration change" (tr. 4/214, 6/269).

38. The Lot 56 sample (size medium-long) failed the endurance testing due to a tear in the aramid cloth in the same location as Lot 53. Government inspectors found that an inner bladder alignment tab at the bottom portion of the abdomen area was torn from the sewn seam of the bladder and attributed the rupture to this tab. Appellant considered that the tab had been torn after, and as a result of, the rupture. (R4, tab 72; tr. 1/80, 5/50-51, 53, 80)

39. Since neither Derm/Buro nor Milliken had any remaining fabric from Lot 53, Derm/Buro sent earlier-completed suits from Contract 4027, including Lot 53, to Mr. Huyen on 2 September 2003 for examination and testing (R4, tabs 73, 78; tr. 1/97-101).

40. Appellant was also asked to send the two failed suits from Lots 55 and 56 to DSCP for review. The failed suits were sent to DSCP on 9 September 2003. Appellant also sent additional suits that had been subjected to endurance testing to assist the government in its examination. (R4, tab 75)

41. By letter dated 16 September 2003, the contracting officer responded to a number of issues raised by appellant. The contracting officer advised that he considered delays caused by the failures to be inexcusable. With respect to the samples, the contracting officer advised that they would be returned by Mr. Huyen of the AF during a

scheduled government plant visit on 18 September 2003. At that time, appellant would also receive the AF response to its corrective action plan for Lot 53. (R4, tab 77)

42. On 18 September 2003, government representatives (including Mr. Huyen) conducted a plant visit in an attempt to analyze why Lots 53, 55 and 56 failed. At that time, Lot 53 was retested and accepted and the sample suits were returned to appellant intact. During the retesting, Mr. Huyen proposed that appellant should lace the suit tighter to the model. Some suit sizes fit the model better and some adjustment may be warranted. The specification does not state how tightly to tie the laces of the garment on to the inanimate model. Appellant did tighten the laces as suggested by Mr. Huyen and the suit passed. The retesting was essentially turned into a resubmission and Lot 53 was accepted. (R4, tab 78; tr. 1/102-07) Mr. Huyen was also to provide an answer to appellant's proposed corrective actions for Lot 53 (R4, tab 77).

43. In October 2003, government QARs visited Derm/Buro's Hialeah, Florida facility to verify the condition and accuracy of the patterns used in DB's cutting operations. They did "not find any problems with their patterns nor markers that might cause a defective or faulty final product." (App. R4, tabs 29, 39)

44. On 21 October 2003, a Lot 55 small/long suit failed during destructive endurance testing. The outer aramid material developed a horizontal rupture in the abdomen area. (App. R4, tab 31A, 311; R4, tab 79) An initial inspection revealed that there were six rows of stitching instead of the required four rows. Too much stitching in a given area may cause a perforation line and weaken the area. (R4, tabs 79, 80; tr. 5/54-55)

45. On 23 October 2003, Derm/Buro re-screened, re-submitted, and re-tested Lot 56 which passed and was accepted by the government (tr. 1/124-25; app. R4, tab 30).

46. Contract No. SP0100-04-D-4031 (Contract 4031) was awarded by DSCP to DB on 30 October 2003. Contract 4031 is an indefinite quantity, firm fixed price contract with a minimum quantity of 7000 and maximum quantity of 11,000 suits for the base year. The quantities for the three option years were a minimum of 6,700 and maximum of 11,600 for each of three option years. Monthly lot sizes to be delivered generally consisted of 761 to 882 suits under the contract as awarded.[4] First Article submission was waived. Contract 4031 incorporated, *inter alia*, the same standard clauses included in Contract 4027 (finding 1). (R4, tabs 40, 41, 53, 60; tr. 4/254)

[4] The lot sizes and delivery dates were adjusted and/or reduced pursuant to various contact modifications (R4, tabs 54-61). Because we conclude that the "coloration change" had a pervasive adverse effect on performance and that all delays in delivery were excusable, we have not detailed all schedule and lot size revisions except as required to describe the essential chronology of events.

Derm/Buro was the sole offeror on Contract 4031 (app. R4, tab 26A; tr. 1/129-30, 2/61, 4/190-91).

47. Two DOs under Contract 4031 were issued during the base year. No options were exercised. On 30 October 2003, DSCP issued DO 1 for 7,000 suits for delivery from 30 May 2004 through 20 December 2004. (Tr. 1/128-29; R4, tabs 53, 60)

48. Appellant completed deliveries of Lots 57, 58, 59 and 60 under Contract 4027, all of which passed testing. The total number of suits delivered in these lots was 2,132. Deliveries were completed over an approximate one-month period in October and November 2003 and before the 26 November 2003 final delivery date under contract 4027. (R4, tab 181 at 37-49; tr. 5/28-29)

49. Lot 55 (designated as 55B) under Contract 4027 was re-inspected a second time on 18 November 2003. The sample medium-regular suit failed the endurance testing due to a tear in the outer aramid material in the abdomen area. (R4, tabs 81, 82; tr. 1/121) The tear in Lot 55B is essentially the same tear that occurred in Lot 53 (R4, tab 64 at 9, tab 81 at 4, tabs 83, 183; tr. 1/121, 127).

50. On 24 November 2003, Derm/Buro provided the contracting officer with Milliken test reports for all fabric used by appellant for Lots 53, 54, 55, and 56 (*i.e.*, the fabric that ruptured during destructive endurance testing). (App. R4, tab 315, tr. 7/335-36)

51. Thereafter, the AF requested vendor reports, left over materials from Lot 55, all previous failed suits and randomly selected new sample suits in order to investigate the cause of the failure. By letter of 4 December 2003, the contracting officer directed appellant to furnish the requested material and information to Mr. Huyen. (R4, tab 84)

52. Notwithstanding the failure of the Lot 55B sample, appellant requested that the lot be accepted (R4, tab 82). That request was denied by the contracting officer on 4 December 2003 pending completion of the AF review (R4, tab 83).

53. DB interpreted the contracting officer's 4 December 2003 letter to mean that it was not to proceed with further work on either Contract 4027 or 4031 until authorized pending the completion of the investigation (tr. 1/140, 166-67; app. R4, tab 40A).

The Failure Investigations

54. By letter dated 18 December 2003, DB indicated it would provide Mr. Huyen with the items and information from Lot 55 as requested by the contracting officer on 4 December 2003. Derm/Buro also advised that upon receipt of instructions from the

government, it would contact the QAR to arrange a date for the selection of the random sample suits. (App. R4, tab 34; R4, tab 84; tr. 1/147-48)

55. In early-to-mid January 2004, appellant shipped nine suits (including all that had failed and others randomly selected by the government) and all requested vendor's reports, certificates of conformance and other items to Mr. Huyen (app. R4, tabs 36, 37, 314; tr. 1/141-42, 149-151, 7/332-35). The vendor reports provided by Derm/Buro including those from Milliken and Lamcotec, indicated the weight and other relevant characteristics of the materials furnished by those suppliers (app. R4, tab 314; tr. 1/153-54, 2/140, 144).

56. On 29 January 2004, appellant sought five "waivers" under Contract 4031, four of which had been previously granted under Contract 4027. Certain "waivers" actually pertained to corrections or clarification of contractual instructions (*e.g.*, regarding the proper matching of zippers and suit sizes), requests for the contractual set of patterns required to be provided by DSCP, and requests to clarify other instructions. With the exception of a request to increase permissible lot sizes, we consider that the "waiver" items generally were routine, non controversial clarifications and administrative matters. Appellant advised the CO that it could not commence performance under Contract 4031 until these "waivers" were addressed and sought a 60 day extension to "compensate for this delay." (App. R4, tab 38; R4, tabs 43, 91 at 3; tr. 2/55-64, 249-52)

57. At some point in December 2003, DB learned of the DuPont "coloration change" from Milliken. Appellant commenced its own investigation to determine the cause of the ruptures and whether the "coloration change" may have contributed to the test failures. (Tr. 1/142-47; app. R4, tab 19)

58. On 9 December 2003, DuPont advised DB that "the chemical details of the Nomex manufacturing process and composition [were] proprietary" but that the Milliken fabric exceeded requirements in the government's fabric specification. DuPont also advised appellant that, because there were no abrasion specifications for the fabric, DuPont did not conduct abrasion tests. (App. R4, tab 32)

59. DuPont further advised DB that tan-colored Nomex fabric had a lower pigment count than the sage green fabric. DB purchased 30 yards of the tan Nomex fabric manufactured by Milliken to the same specification as the sage green. Appellant then manufactured two suits from the tan fabric and subjected them to endurance tests. Both tan suits passed the destructive endurance test (one at 2,000 inflations). Appellant hypothesized from its tests that pigment variations might influence the ability of the fabric to withstand the destructive test and the tan suits (with less pigment) would more easily pass the test. (Tr. 1/156-60, 241, 2/82)

60. At DB's request, Milliken also performed abrasion tests on pre- and post-color-change fabric. Milliken concluded that the abrasion resistance properties of the two fabrics were "significantly different" and the post-change fabric was less resistant to abrasion. (App. R4, tabs 40, 85, 99; tr. 1/156-60, 241-42)

61. Appellant contacted Dr. Jan Pegram, a professor and researcher in the Textile Department of North Carolina State University (NCSU) to arrange for further abrasion testing of the pre- and post-change fabric. Following her tests, Dr. Pegram prepared a report dated 26 February 2004. She also observed significantly lower abrasion resistance in the post-color change fabric and concluded that "the change in [DuPont's fiber] dyeing procedure affected the abrasion resistance of the yarns, as evidenced by the failures occurring where the yarn came in contact with the inflation bladder during endurance testing." (R4, tab 86 at 14-16; app. R4, tab 65 at 006614; tr. 1/162-64)

62. By letter dated 1 March 2004, appellant detailed the history of the fabric ruptures and informed the government of the results of its investigations with DuPont, Milliken and the NCSU Textile Department. The letter, *inter alia*, forwarded Dr. Pegram's test results to the contracting officer and requested meetings with the government to discuss its conclusions. Appellant alleged in the letter that the government had changed the "chemical formulation of the fiber, which adversely affected the flex abrasion properties, [and] breached the Government's implied warranty that a satisfactory product will result despite destructive endurance testing." (R4, tab 86; tr. 1/175-77)

63. On 3 March 2004, appellant again claimed that the lot failures were caused by the DuPont "coloration change". DB also advised that it could not order material and start production under Contract 4031 until it received a response from the government to its 29 January 2004 "waiver" requests. (R4, tab 87)

64. On 10 March 2004, appellant received a telephone call from Mr. Huyen who was conducting the AF investigation. During the telephone call to appellant, Mr. Huyen stated that he "knew that the fabric was the problem" and inquired as to the feasibility and cost of replacing the fabric covering the waist bladder with material supplied by the government. Mr. Huyen considered that, because the source of the problem had been identified, it was unnecessary to endurance test the suits provided by appellant and returned them to DB. (Tr. 1/179-80; R4, tab 95; app. R4, tab 46) Mr. Huyen also attempted to contact Dr. Pegram to discuss and confirm her findings (tr. 1/191-93).

65. As of 17 March 2004, the Navy also considered that the "coloration change" had caused the failure (app. R4, tab 47; tr. 7/110). On 17 March 2004, Ms. Wendy Todd of the Navy notified DSCP of the results of tests she had performed on pre- and post-color-change fabric stating in part:

> Both fabrics failed to meet warp break strength but the new fabric also failed to meet warp tear strength. The new fabric's failure to meet tear strength indicated a specific deficiency with the yarn. Both fabrics had identical weights (4.5 oz/yd); (however) the fabric count in the fill direction was more than that in the old, indicating that the yarn mass had decreased as weight was unchanged…
>
> …[T]he validity of the US Navy results are reinforced by third-party testing performed by Dermburo[sic], who meanwhile had conducted an investigation of its own with [NCSU] with Milliken's assistance…
>
> …[T]here is sufficient evidence to suspect that there is a problem with the fabric, both for initial acceptance and for service life of the g-suits.

(App. R4, tab 47)

66. By letters dated 18 and 24 March 2004, appellant again asserted the lot failures were caused by the "coloration change" and that it could not proceed with production under Contract 4031 until the government acted on its "waiver" requests (R4, tabs 89, 90).

67. On 25 March 2004, the contracting officer notified appellant that he was awaiting the results of Mr. Huyen's investigation and no decision would be made on the disposition of Lot 55 until the AF concluded that investigation. The contracting officer also enclosed Modification No. P00002 under Contract 4031 granting all "waivers" requested by appellant with the exception of its request to increase the lot sizes from 500 to 600 suits. (R4, tabs 43, 92)

68. On 5 April 2004, DSCP sent an email inquiry to Mr. Huyen concerning the status of his investigation. The email stated in part, "[DSCP] cannot accept anymore delays. We must respond back to the contractor with, at the very least, status of the request for engineering action and any decisions that you have made." (R4, tab 95) Mr. Huyen responded on the same date stating that it was not necessary to conduct endurance tests on the suits based on his review of Dr. Pegram's report. Therefore, the four Lot 55 suits were returned to appellant. However, Mr Huyen also stated that the AF was continuing to investigate whether the suits otherwise fully complied with the specifications. (R4, tab 95; tr. 4/35-40)

69. On 5 April 2004, the contracting officer sent a memo to Mr. Huyen noting the lack of a written reply on the "final disposition of Lot 55" and requesting AF input on the

adequacy of the Contract 4031 cloth specifications and testing requirements. The contracting officer further advised that that the Navy had decided to perform additional testing of the suits. (R4, tab 96)

70. On 6 April 2004, Mr. Huyen emailed Dr. Pegram regarding her findings related to the "coloration change". The email stated, "we have no idea how" the "coloration change" affected the physical properties or performance of the suits. Mr. Huyen asked Dr. Pegram if he could contact her to discuss her report, the introduction of a new abrasion resistance requirement into the specification and whether the "coloration change" had an "affect on performance/requirements." (App. R4, tabs 54A, 55; tr. 4/104-45, 149-52)

71. Mr. Huyen found no evidence of faulty manufacturing or poor workmanship by appellant during the course of his investigation (tr. 4/170-72).

72. On 16 April 2004, the contracting officer notified appellant that Lot 55 was rejected with no resubmission authorized (R4, tab 98).

73. In an internal "Fact Sheet" dated 19 April 2004, the contracting officer summarized events related to the lot failures stating in part:

> - In March 2002, the cloth specification (MIL-C-8342B) was changed by DSCP-COC to incorporate changes to the spectral reflectance requirement. A letter was sent to a number of manufacturers notifying them of change however [DSCP-]COE was never made aware of it and apparently the Using Services were not afforded the opportunity to provide comments.
>
> ….
>
> - On March 1, 2004 Derm Buro submitted a study from [NCSU] that concluded that the change to the spectral reflectance requirements may have been responsible for the failures under Lot 55 (as well as failures under Lot 53 and 56). After receiving the Derm Buro study, the Air Force decided not to bother testing the suits and sent them back to the contractor.
>
> - In the interim, all Anti-G stock was frozen at the depot….
>
> ….

- DSCP sent repeated requests for final disposition of Lot 55 to the Air Force. Finally, on April 5, 2004, the Air Force sent an email reply indicating that Lot 55 should be rejected….

- The Navy and the Air Force disagree on a process forward. The Navy requested samples from the Lots 53 through 59 (excluding Lot 55 as it was never accepted) to perform a risk analysis on the suits given concern about the integrity of the cloth.

- Preliminary results of Navy testing on two lots (53 and 56) indicated breaking strength failures.

  ….

- On April 16, 2004, Derm Buro notified DSCP that Le Hugyen [sic] had been trying to contact the person at [NCSU] to discuss their test findings and also see if they can make recommendation to him on how to go forward and if they think the cloth is "safe". The personnel at [NCSU] refused to email him back.

CONCLUSION

- DSCP will notify Derm Buro about the rejection of Lot 55. It is expected that Derm Buro will submit a claim in [sic] against the Government for all costs associated with the Lot given what has transpired above.

- No final decision has been made about how to proceed with the new contract [Contract 4031] (first delivery due May 2004 or if the Air Force/Navy will be willing to accept any suits from Lot 53 through Lot 59. It appears that the Air force had "brought into" the contractor's claim that the cloth change is responsible for the failures, based on the fact that they decided not to test any suits and have been emailing [NCSU] to try to get their opinion on the matter. Moreover, Frank Guthart has indicated to us that Le Hugyen [sic] of the Air Force contacted him and indicated that

> based on the [NCSU] study, he thought all of the suits in the Lots in question are "bad" and not fit for use. The Navy will decide whether or not they are willing to accept suits after completion of their risk analysis.

(App. R4, tab 59) (emphasis in original)

74. On 22 April 2004, DSCP issued Modification No. P00003 (Mod. 3) to Contract 4031 which added three qualified testing laboratories to the approved list of labs available for testing cloth samples. Mod. 3 also authorized the government's QAR to cut cloth samples from fabric lots manufactured by the cloth manufacturer (Milliken) to be sent to both the designated lab and to DSCP for verification testing prior to shipping the lot to appellant. (R4, tab 44)

The Weight Range Revision Solution

75. On 29 April 2004, the parties and a representative of Milliken met at appellant's request to discuss the disposition of Lot 55 and fabric rupture issues generally. Appellant continued to maintain its position that the ruptures were attributable to the DuPont "coloration change". It also emphasized that the abrasion resistance of tan-colored fabric significantly exceeded that of the sage green garments. Discussions at the meeting focused on finding possible solutions. Appellant and Milliken suggested that increasing the weight of the fabric might increase its resistance to rupturing. They suggested that increasing the weight from the specified 4.3 – 5.0 oz. range to a 4.8 – 5.2 oz. range might resolve the problem. The possible weight range revision was forwarded to the AF and Navy for review. (Tr. 1/187-88, 196, 203-04, 218, 2/194, 4/41, 45, 197-98; app. R4, tabs 63A, 66; R4, tab 100) Appellant wanted to expand the range above 5.0 oz and considered that if the maximum weight was not revised it would simply order cloth from Milliken on the heavier end of the range (tr. 1/217). No consideration was given by the government to reverting to requiring the use of pre-change fiber/cloth (1/203).

76. The first delivery under contract 4031was due on 30 May 2004. Appellant timely delivered 890 suits (DB production Lots 1 and 2) on 5 May 2004. No further deliveries under the contract were made by appellant until 25 January 2005. (R4, tabs 53 at 4, 181 at 51-65)

77. Also on 5 May 2004, DB proposed that it would completely remanufacture Lot 55 using only heavier fabric on the higher end of the permissible weight range. The parties agreed that the remanufactured lot would be redesignated Lot 61. (R4, tabs 100, 103, 104; app. R4, tab 74)

78. As of 12 May 2004, the AF and Navy had concluded and recommended that the specification's fabric weight should be revised to 4.8 – 5.0 oz. to facilitate passing the

destructive endurance tests. The government considered that the narrower range "would work better" and would not exceed the previous 5 oz. maximum. (App. R4, tabs 73, 74; tr. 1/217-20, 4/198, 200, 7/151-58)

79. On 13 May 2004, the contracting officer advised appellant that DB was to resubmit Lot 55 using "heavier fabric" and to redesignate the remanufactured lot as Lot 61. In addition, appellant was notified that the heavier fabric was to be used for Contract 4031. The contracting officer's letter stated that both the AF and Navy considered the weight for the fabric should be in the 4.8-5.0. range. (App. R4, tab 75; R4, tab 101; tr. 1/189-91, 195-96; 2/272-73)

80. On 14 May 2004, appellant notified the government that it considered that the problem could be remedied by the weight revisions and advised that it would be submitting claims for costs incurred due to failure of Lot 55 and for increased material costs associated with the heavier fabric, as well as a revised delivery schedule for contract 4031 and a value engineering change proposal (VECP) for the weight change suggestion (R4, tab 102).

81. On 17-18 May 2004, the contracting officer exchanged emails with Ms. Jean Rosso, DSCP's supervisory product specialist for the suits. The contracting officer noted that he was "awaiting Milliken's evaluation of the Government's fabric weight request (4.8 – 5.0)" and questioned whether Derm/Buro's possible use of lower weight fabric on Contract 4031 was acceptable, "when the services could come back and say that they want 4.8 as a minimum." (App. R4, tab 77; tr. 4/8, 175) Ms. Rosso responded in pertinent part:

> Yes. Derm-Buro is in compliance with the current contract requirements. The current cloth spec allows the weight of the cloth to be 4.3 to 5.0 oz./sq. yd.
>
> The Service wants to narrow the range to the upper end for the weight of the cloth based on what Derm-Buro found through their research and that is the heavier the cloth (more pics per inch) will better fit the endurance testing that the Anti-G Suit endures. The confidence level for successful testing is greater when using the heavier cloth.
>
> It may not be realistic to have such a narrow range for the weaver to meet, that is why I wanted to know what Derm-Buro and Milliken feel comfortable with and propose a wider ranger [sic] to the services.

> I believe that Milliken knows to provide Derm-Buro with better cloth (heavier) in order for this item to pass the testing.
>
> Derm-Buro is manufacturing suits that are made with cloth that weighs in at 4.5 oz. Frank [Derm-Buro] said that he has asked Milliken to provide him with heavier cloth (4.8 oz) so he can produce suits at that weight as well.
>
> Derm-Buro wants the cloth range to be 4.5 – 5.2 oz/sq. yd. Mr. Guthart (I spoke to him briefly yesterday at lunch) said he feels very comfortable with the cloth if we change it to 4.5-5.2 oz. He said the services (sic) proposal of 4.8 – 5.0 is to [sic] small a target to meet. I agree.

(App. R4, tab 77*)*

82. On 20 May 2004, a Navy representative proposed to AF and Navy engineers, *inter alia*, revising the fabric weight range to 4.7 to 5.0 oz. (app. R4, tab 233).

83. On 2 June 2004, appellant proposed to the government that the weight range be revised to 4.8 – 5.2 for future Contract 4031 production lots. DB stated that it could not proceed until the issue was resolved. (R4, tab 104)

84. A 10 June 2004 email from the contracting officer, Mr. Price, to his supervisor, Mr. Johns, stated in part:

> To date there has been no definitive decision by the Government to establish a fabric specification that will meet the destructive endurance testing requirements. The suggestion on 4.8 – 5.0 by the services according to Derm/Buro's manufactures [sic] is to [sic] stringent. Frank said that Jeanie [Rosso (DSCP)] agrees with this…
>
> The delays in getting responses since Aug 03 has caused a financial burden on Derm/Buro according to Frank. He still is not getting any answers and he is doing all the work in trying to determine a proper fabric to meet the testing requirements….
>
> Is Derm/Buro doing work for the services to establish the proper material specifications? Why can't the services give us a definitive answer? In the mean time [sic], Derm

> Buro can't handle the financial problems caused by the delay:
> Payrolls, expenses, etc.

(App. R4, tab 77C)

85. In the same email string on 10 June 2004, Mr. Johns noted to Mr. Price that appellant had advised that it may take up to 18 weeks for fabric suppliers to produce the heavier weight fabric once the government revised the weight range (app. R4, tab 77C).

86. Also on 10 June 2004, appellant informed the contracting officer that the weight change suggestion was not intended to be a contractor-requested change and also sought assurances from the government that it would not be held responsible for failures if it proceeded to manufacture Lot 61 (R4, tab 105).

87. On 14 June appellant requested an extension of the Contract 4031 delivery schedule the duration of which would be dependent on government approval of the fabric weight range revision (app. R4, tab 77D, R4, tab 106).

88. In emails dated 16 June 2004, the Navy and AF technical personnel agreed to tighten the fabric weight range from 4.3 – 5.0 oz. to 4.8 – 5.0 oz. (R4, tab 78). They considered that the heavier weight of the fabric would resolve problems believed at that time to have been caused by the "coloration change" (tr. 7/160, 163-64).

89. On 17 June 2004, Ms. Rosso issued a memorandum to contracting officer Mr. Price advising that the weight change revision had been coordinated with the Navy and AF and would be effective for Lot 5 and subsequent production lots (app. R4, tab 79).

90. The contracting officer advised DB that the weight change was approved and would be effective beginning with Lot 5. The contracting officer requested that appellant provide a revised delivery schedule recognizing that appellant was excusably delayed pending receipt of the heavier weight fabric. (R4, tab 107; tr. 4/204)

91. Before implementing the revision, the Navy had asked Milliken whether it would be able to provide cloth satisfying the revised range requirements. By email of 18 June 2004, Milliken advised the Navy that the "weight increase from our previous trial fabric of 4.6 oz / sq yard will require a new warp / fill construction and can not be made using our existing . . . Warps." (Tr. 6/141; app. R4, tabs 78, 80)

92. On 23 June 2004, appellant requested that the fabric weight range revision be implemented beginning with Lot 3. Appellant considered that more immediate implementation would facilitate testing and production of the heavier fabric. (R4, tab 112)

93. Lot 61 under Contract 4027 was inspected and delivered on 24 June 2004, successfully passing all testing and completing deliveries under the contract (R4, tab 113; tr. 4/188).

94. The government issued unilateral Modification No. P00004 (Mod. 4) under Contract 4031 revising the permissible fabric weight range to 4.8 – 5.0 oz. The change was effective starting on 24 June 2004 with Lot 3 as requested by appellant. (R4, tab 45; tr. 1/215-17) On 24 June 2004, the contracting officer again requested appellant to provide a revised delivery schedule (R4, tab 114).

95. The government did not perform any testing to determine the effects of the fabric weight revision (tr. 1/63-65, 219-20, 4/65, 108, 7/159-60).

96. The cost paid by appellant to its suppliers for the fabric increased as a result of the weight range revision (tr. 1/195-204; app. R4, tab 97).

97. On receipt of Mod. 4, appellant placed a new purchase order for the revised weight range fabric. Milliken initially estimated that shipment would occur in eight weeks. (Tr. 1/225-28)

98. On 8 July 2004, DB submitted an REA for the government seeking $989,268. Because the contracting officer considered that the costs were incurred under both contracts, he requested additional breakdown and documentation by contract and resubmission as two separate claims. (R4, tabs 117)

99. On 14 July 2004, appellant proposed a revised delivery schedule contingent upon the heavier fabric passing destructive endurance testing because appellant was unaware of any government tests had been conducted to determine the effects of the change. DB requested any test data demonstrating that the new cloth would pass endurance testing. Under appellant's proposed schedule, the initial shipment would be due on 29 December 2004 and the final shipment on 30 August 2005. (R4, tab 118)

100. On 20 July 2004 appellant again requested any available government test data and indicated that DB's previously proposed delivery schedule would not be valid after 26 July 2004. The contracting officer advised DB that the government found the testing contingency unacceptable. (R4, tab 119; tr. 4/206-07)

Further Government Investigation Results

101. By email dated 27 July 2004, DSCP asked the AF's Mr. Huyen "how the [government] came to the conclusion" that the heavier fabric would pass destructive endurance tests. Mr. Huyen responded by email on the same date stating that the 4.8 -

5.0 range was within the originally-specified range and the AF concurred "with [the] Navy because it will help to make a stronger fabric (fill and warp direction)" and possibly increase service life. (R4, tab 121)

102. DB submitted a revised Contract 4031 schedule to the government on 29 July 2004 containing no contingencies and providing for deliveries to commence on 28 February 2005 and be completed on 31 October 2005 (R4, tab 122).

103. The AF eventually prepared a "Response to Appellant's Investigative Report" for DSCP. Although dated 2 July 2004 and signed by Mr. Huyen of the AF, the report was authored by Ms. Wendy Todd of the Navy (without material change by Mr. Huyen) and was not received by DSCP until late July 2004. (R4, tabs 87, 116; tr. 6/102, 127-30) The report was based on conclusions derived from the Navy's continuing earlier investigation of the failures (tr.7/7). The report stated in pertinent part (Rule 4, tab 116):

> 1. Background. Derm/Buro Inc., the contractor for SPO-100-00-D-4027 (referred to hereafter as the Contractor) contended in encl (1) that quality assurance failures of their product per ref (a) were attributable to a 2003 change in the specified near infrared (NIR) spectral reflectance requirement of the cloth. This cloth, made to comply with MIL-C-83429, Type II, Class 6 (ref b), ruptured during endurance cycling. Such ruptures resulted in rejection of Lot 55 in November 2003. The Contractor furnished data from North Carolina State University (NCSU) and Milliken & Company as evidence that the 2003 NIR change was the causal factor of the ruptures (encl 1). DLA requested engineering support to address the contractor's issues.
>
> 2. Government Review of NCSU Data. NCSU elected to analyze abrasion resistance (a property not controlled by the specification) of pre-2003 and 2003 fabric specimens using ASTM 3885 (ref c). No other tests were run by NCSU. Many of the pre-2003 specimens provided to NCSU were not documented as or verified by testing to be representative of the type and class of the specified fabric. Additionally, NCSU was not provided sufficient numbers of these specimens as required by the test method. Taking these discrepancies into account, the well-known unrepeatability of the ASTM 3885 test method, and the absence of any other corroborating test data, the Government did not consider the

flexion abrasion results submitted by NCSU as cogent evidence that the 2003 fabric caused the ruptures.

3. Government Review of Milliken Data. Milliken, like NCSU, did not conduct any specification-compliance tests. For the tests they completed, Milliken did not document compliance with ASTM test methods, or type and class of the specimens. They also did not report any of the basic data required by ASTM reporting protocol, such as the number of fabric specimens, units of measure, and whether the figures reported were means or individual results. As any reputable testing agency will attest, such data have no technical validity and thus could not be considered in analysis of the Contractor's issue.

4. Government Fabric Testing. The USAF and the US Navy conducted specification performance tests as well as the ASTM 3885 test on fabric specimens cut directly from the anti-G suits of Lots 53, 54, 56, 57, 58, 59, and 60 (Lot 55 was unavailable); and on specification-compliant, pre-2003 and 2003 fabric specimens (encl 2). Both Navy and USAF test results showed that specimens were compliant with the specification requirements. On the other hand, Navy testing did not verify the trends reported by NCSU. Instead the data showed that the 2003 fabric specimens had higher abrasion resistance than pre-2003 specimens. The Government also conducted endurance cycling and post-endurance leakage on eight anti-G suits from Lots 53-57 (excluding Lot 55). All but one suit endured 10,000 cycles (and that one suit lasted 9,000 cycles) to 15PSIG without failure, and passed post-endurance leakage as well. Because the Government could not verify NCSU's findings with respect to decreased abrasion resistance, and because the fabric met or exceeded all requirements of the specification in bench and end item tests, the Government concluded that there was no data to support the Contractor's claim that the 2003 fabric was responsible for the ruptures observed during endurance testing at the Contractor's facility.

5. Recommendation. The fabric used in Lots 53-60 weighed in at close to the minimum required (encl 1; encl 2). The Contractor, convinced that the new dye formulation had weakened the fabric, proposed that a heavier fabric would

> address their concern about end item performance. Specifically, the Contractor suggested that fabric weight requirements be increased from the current 4.3 – 5.0 ounces per square yard to 4.8–5.2 ounces per square yard (encl. 3).
>
> It is true, in general, that a heavier fabric is a stronger fabric as measured by its break strength. However, higher weight is often purchased at the cost of tear resistance. In the Government's view, tear resistance is as important as break strength for anti-G suit performance. Thus, the Government did not agree to a weight increase, especially as the test data did not reveal any deficiencies in fabric performance. The upper limit of fabric weight was retained as 5.0 ounces per square yard.
>
> However, the Government saw no risk in *tightening* the specified weight range toward the upper end of the specification for fabric weight. Hence, the Government, to assuage the Contractor's concerns, agreed to raise the minimum fabric weight. A lower limit of 4.8 ounces per square yard was chosen because industry tolerance for manufacturing to weight is within 0.25 of an ounce, thus 5.0 ounces per square yard as a maximum less a 0.25 tolerance is 4.75 ounces per square yard, or 4.8 with one significant digit per the specification.

104. Although not required by the specifications, the Navy had performed trapezoid tear and flex abrasion testing during its investigation which revealed that the new fabric was weaker than the pre-change cloth. But Mr. Eric Bryan, who conducted the tests for the Navy, did not consider that the differences were significant or material. During the course of its investigation, the Navy did not discover any manufacturing defects, poor workmanship or nonconforming work, including deficiencies related to the sewing tolerances or the bladders used in the suits. (Tr. 5/159-170, 172, 182-83; R4, tabs 93, 138)

105. On 13 August 2004, Mr. Johns of DSCP requested that Mr. Gary Trammel who was the branch chief of the AF's cognizant technical section at Brooks AFB and Mr. Huyen's supervisor, provide additional details and analysis of appellant's allegations (app. R4, tab 89; tr. 1/237, 4/146).

106. Mr. Trammel filed his report and analysis (Trammel Report) on 24 August 2004 (R4, tab 123). There is no evidence that the Air Force conducted a separate analysis of the fabric or suits and the results appear to be based on data

developed during the earlier Navy testing. In summary, the Trammel Report concluded as follows (*id.* at 2, 8):

> The Government's investigation found that a) the fabric used by the Contractor in its Lot 55-60 anti-G suits was in compliance with the specification requirements, b) the post-IR-change fabric strength was comparable to pre-IR-change fabric performance, c) the fabric used by the Contractor to manufacture Lot 55 was comparable to that used in lots that were accepted, d) the fabric's abrasion resistance was not decreased, and 3) the fabric withstood not only the required endurance cycles, but *several times* the requirement.
>
> ….
>
> In summary, because the post-change fabric met or exceeded all requirements of the specification in bench tests; because the Government could not verify the Contractor's claims with respect to decreased abrasion resistance (which is not a requirement of MIL-C-83429B) and, most importantly, because the fabric exceeded all requirements of the end-item specification (ref a) in strenuous, excessive end item tests, the Government can only conclude that there is no evidence to support the Contractor's claim that the change to the NIR requirement incorporated in fabric manufactured in 2003 was responsible for the ruptures observed during lot acceptance testing at the Contractor's facility.

107. The Trammel Report reviewed the conclusions of the NCSU and Milliken analyses and rejected them for the following reasons (*id.* at 4):

> **3.5** ***Summary of NCSU Testing***. Because it is unknown whether NCSU specimens complied with the MIL-C-83429B; because they did not test sufficient numbers of these specimens; because there were no other corroborating test data and because of the inherent variability in the test method, the Government cannot consider the flexion abrasion results submitted by NCSU as cogent evidence that the 2003 fabric was the causal factor of the ruptures.
>
> **3.6** ***Summary of Milliken Testing.*** Milliken's report does not document compliance with any ASTM test method,

> nor any of the basic ASTM (ref e) reporting requirements such as the number of fabric specimens, the source and type of fabric specimens, and whether the figures reported are means or individual results. As any reputable testing agency will attest, such data have no technical validity and cannot be considered in analysis of the Contractor's issue. Nonetheless, if Milliken's data are considered independent of these factors, the data themselves indicate unchanged performance for abrasion – except for the flexion/abrasion data, for which Milliken did not identify what kind of fabric they tested, which in turn casts doubt on their results.

108. As part of his investigation and government testing, Mr. Trammel conducted a detailed visual inspection reporting as follows (*id.*):

> ***4.1 Visual Inspection of Lots 53, 54 and 56-60 Anti-G suits.*** The anti-G suits were inspected for compliance with the specification with regard to workmanship, finished dimensions, and pattern dimensions. It was possible that if a) the bladder was oversize, b) the shell was undersize or off grain, or c) if stitching was too tight or too small, etcetera, that the ruptures could be explained. However, the garments inspected did not exhibit any specification related deficiencies.

109. The destructive endurance tests performed by the Navy and discussed by Mr. Trammel as part of his investigation were not conducted using models that complied with the specification. Instead the suits were attached to a "medical training manikin of soft rubber skin dressed in a coverall" during the tests. (*id.* at 5; tr. 6/109-10) However, Mr. Trammel considered use of the soft mannequin "harsher" and "more severe" than appellant's hard, fiberglass-coated model (*id.*).

110. On 15 September 2004, noting the lack of government response to its requests for technical data and prior proposed delivery schedules, DB updated its delivery schedule proposal with deliveries commencing on 31 March and ending 31 December 2005. DB proposed that the size of the first six lots be reduced to 440 suits per lot, for a total 2,640 suits in the first six lots and thereafter increase to approximately 850 suits per month. (R4, tab 126)

111. By letter dated 17 September 2004, the contracting officer forwarded unilateral Modification No. 0001/01 (Mod. 1/01) under Contract 4031 to appellant adopting the delivery schedule proposed by DB in its 15 September 2004 letter (R4, tab 127). The letter also addressed appellant's claims stating in part as follows (*id.*):

SP0100-04-D-4031

….

…However, by unilaterally implementing the revised delivery schedule the Government is not accepting contractors (sic) condition that it is entitled to an equitable adjustment under SPO100-04-D-4031 or SPO100-00-D-4027.

With regard to your claim under SPO100-04-D-4031, the only permissible claim for equitable adjustment that could exist as a result of modification No. P0004 would be for any increase in material cost. As you will recall, P0004 was issued at your request. It was not issued to cure any alleged defect in the specification. The contracting officer is willing to entertain any claim for increased material costs incurred as a result of No. P0004. If you chose to submit a claim please include a cost breakdown.

SP0100-00-D-4027

Regarding Derm/Buro's claim for equitable adjustment relating to lots 53, 55, and 56, relating to SPO100-00-D-4027 not SPO100-04-D-4031. It is Derm/Buro's position that a change in the manufacturing process of the fiber by the manufacturer caused the failures in of lots 53, 55, and 56 to pass the endurance test found in Mil-A-83406B. The attached [Trammel] Report, dated August 31, 2004, describes in detail the Governments findings.…In summary, the Air Force found that…Anti-G Garments made with either pre or post 2003 fabric passed the endurance test as well as all other requirements. In view of the Air Force findings, there is no evidence that the endurance test failures of lots 53, 55, and 56 were caused by the change in manufacturing process of the fiber.

In addition, it appears that in your claim letter dated July 8, 2004 you are claiming expenses associated with of lots 53, 55, and 56, deliveries under SPO100-00-D-4027, under SPO100-04-D-4031, which is not appropriate. If you believe that you have a valid claim for additional costs associated

> with lots 53, 55, and 56 it must be submitted separately under SPO100-00-D-4027 and must include a cost breakdown.

112. On 1 October 2004, appellant objected to the government's determination that DB was not excusably delayed. Appellant requested additional technical information relating to the Trammel Report and advised that its ability to meet the schedule was dependent on obtaining specification compliant fabric. It suggested that the fabric be provided as government furnished material. It also submitted a claim for increased material costs in the amount of $47.32 per suit. (R4, tab 128)

113. In a letter to DB dated 7 October 2004, Dr. Pegram of NCSU responded to the Trammel Report and its critique of the abrasion testing conducted by NCSU, stating in part as follows (app. R4, tab 98):

> The College of Textiles was asked by DermBuro to provide a test method which could be used to predict whether a fabric would allow failure in endurance testing, which is conducted in garment form. At the time we were contacted, none of the existing fabric specifications (e.g., weight, count, tensile strength, or tear strength) seemed to correlate with garment failure in endurance testing. Derm/Buro indicated to us that the failures had not been a problem until the year 2003 and that they only occurred with the sage green fabric color. You also indicated that the failures appeared to coincide with a change in colorant formulation of the solution-dyed Nomex fibers that make up the bulk of the yarns in the woven fabric in question. NCSU had no independent knowledge of the pigment formulation prior to or after the reported change, which was necessary to meet government requirements for NIR spectral reflectance. It was not our purpose to prove or disapprove that the pigment formulation change was the cause of the endurance failures; rather, we were trying to find a standard test method that might show some correlation to the observed garment failures. Based on the information we were given that all other processing was identical and the only change was in NIR pigment formulation, we deduced that this change had something to do with the failure. The abrasion testing was not intended to prove a correlation to NIR pigment formulation, but common sense would dictate that it would be desirable to test in fabric form for potential problems before the time and expense of making the fabric into a garment.

Inspection of the failed garments and the description of the endurance test method indicated that the fabric failure always occurred at the point of contact between the surface of the fabric (distinct from any garment seam) and the edge of the internal air bladder that was cyclically inflated and deflated during endurance testing. The fabric failure showed characteristics of neither tensile failure nor tear failure. The forces exerted by the edge of the air bladder during the test are different than the forces exerted during a typical tensile test, in which they are applied end to end parallel to the yarns in the fabric, as well as the forces exerted during a typical tear propagation test, in which they are applied perpendicular to the direction of the yarns. In addition, tensile and tear testing are not cyclic in nature. The endurance test is a cyclic stress-relaxation fatigue test. The location of the failure at the edge of the air bladder indicates that failure was caused by abrasion of the fabric surface against the air bladder edge. For this reason, we chose a standard fabric abrasion test, ASTM D3885 (Flexing and Abrasion), to try to establish a correlation between a fabric property and garment failure during endurance testing.…

We realize that variability within and between laboratories is characteristic of all abrasion test methods due to the nature of the abrasion process and the complex structure of textile materials. The paragraph cited by Mr. Trammel in Paragraph 3.4 of his memo is standard wording for all ASTM standards for abrasion, including ASTM D3884 (Rotary Platform), ASTM D3886 (Inflated Diaphragm), ASTM D4157 (Oscillatory Cylinder), and ASTM D4966 (Martindale). We chose ASTM D3885 because the abrading surface is constant, the end point (number of cycles to fabric break) is not subjective, and it most closely represents the action occurring during actual garment endurance testing. Because we have experience in conducting this test, we have minimized the within sample variance that could be caused by operator technique. This would allow us to compare a series of samples for differences in abrasion resistance by this technique. The samples we tested were provided in both fabric and garment form by Derm/Buro. We cup specimens for testing in accordance with the standard method. In those cases where we reported results for fewer than five specimens per fabric direction, we suspended testing because the first

> two or three specimens were consistently much higher in end point numbers and were taking much longer to run, particularly for the tan fabric. In order to test some of the other samples, we suspended testing off the long-running samples upon consultation with Derm/Buro.
>
> The only data set with two specimens was the tan fabric in the warp direction, but the results showed the abrasion resistance of the tan fabric to be significantly higher than that of the any of the sage green samples.…The tan fabric outperforms any of the green fabrics in the abrasion test. Since all other processing except the colorant formulation is the same for the tan and green fabrics, we suspect that the colorant formulation can indeed affect fabric wear properties. In addition, the comparison of means test did show a significant difference between the pre-2003 green fabric and the green fabrics manufactured in August and October of 2003.
>
> In spite of its shortcomings and inherent variability, we feel that the flexing and abrasion test, when performed in a consistent manner exactly as prescribed in the test standard, can provide more useful information in predicting how a fabric will perform when made into a garment and subjected to the prescribed endurance test than will tensile and tear testing.

114. On 15 October 2004, Ms. Rosso reported the results of tests conducted by DSCP on 22 previously-accepted garments in its possession that were produced by appellant under Contract 4027. Nine of the tested suits were from Lots 1 through 22. The remaining 13 samples were taken from Lots 46 through 50, 52, 54, 56, 57 and 58. The tests were intended to determine the weight of sample suits and when the post-"coloration change" fabric was used by appellant in manufacturing the suits. The DSCP tests indicated that 12 of the tested suits were manufactured from cloth weighing 4.2 oz. DSCP determined that the samples from Lots 56, 57, 58 and 60 weighed 4.2, 4.4, 4.3, and 4.2 oz., respectively. DSCP also determined that the post-coloration-change fabric was used in suits manufactured by appellant as early as Lot 46. (R4, tab 129)

115. Following the low weight readings reported by the Navy investigation, DSCP increasingly relied on verification testing rather than Milliken's test reports (R4, tabs 126, 127; tr. 1/53, 4/228, 5/126).

The Claims and Appeals

116. On 19 October 2004, appellant prepared a detailed 208 page response and rebuttal to the Trammel Report and government contentions generally regarding the fabric ruptures. Appellant summarized the history of the disputes and Dr. Pegram's conclusions, incorporated many of its prior letters and detailed previous arguments alleging, *inter alia*, government-caused delays (including delays associated with the weight range revision), defective specifications, breach of the implied warranty of the specifications, government failure to disclose the "coloration change" and general failure to cooperate and timely investigate the source of the problem. In particular, DB alleged that it was excusably delayed from 7 August 2003 through 17 September 2004 while awaiting resolution of the issues and government directions as to how to proceed. (R4, tab 131)

117. On 25 October 2004, appellant submitted certified claims under both contracts to the contracting officer. The monetary damages sought under Contract 4027 were in the amount of $519,367. The contract 4031 claim sought $652,809, exclusive of increased costs associated with the Mod. 4 weight range revision for which it claimed a "Direct Labor Unit Increase" of $106 per suit. The claims under both contracts sought substantial delay-related damages, including increased indirect cost "burden" (which we construe to be unabsorbed overhead during the period of delay) as well as "idle facility" costs under Contract 4031. Both claims referenced appellant's detailed response of 19 October as providing the underlying rationale for the damages sought.[5] (R4, tabs 132, 133)

118. On 16 and 23 November 2004, the Navy issued a rebuttal to appellant's assertions (R4, tabs 138, 139). The Navy included the results of its tests conducted in 2004 which showed, *inter alia*, that all suits from Lots 53, 54, 56 and 57 exceeded endurance test requirements and that "pre-coloration change" suits performed similarly to post-coloration-change suits (*id.*; R4, tab 99; tr. 5/155-67, 172-74). Among other things, the Navy continued to maintain that: use of the soft mannequin in its earlier endurance testing of DB's suits represented a "more severe" test than use of the specified hard mannequin. The Navy considered that the government "did not authorize a weight increase" because the revised weights were within the original 4.3 to 5.0 oz. range and consequently the original tear strength requirements did not require reexamination or revision. With respect to the weight range revision, the Navy also stated that "the Government made a concession to tighten the manufacturing tolerances…. This constituted a compromise: the Government agreed to accept a potential increase in unit cost as the price of keeping aviators safely equipped." (R4, tab 139) The Navy concluded by stating:

[5] Although the Contract 4027 claim (R4, tab 132) refers to a 22 October 2004 letter as providing the rationale, there is no such letter in the file and in the overall context of the correspondence preceding and after the claim, it is clear that appellant intended to reference the key 19 October 2004 response.

> 15. [The Navy] appreciates Derm/Buro's conscientious attitude with regard to the safe manufacture and performance of the CSU-13B/P garment. [The Navy] agrees that the tested Derm-Buro products performed without flaw in Government endurance cycling, and that the Derm/Buro products in question exhibited no defects of workmanship. However, [The Navy] believes that the investigations of both Derm/Buro and the Government show the failures observed in Lot 55 cannot be attributed to the NIR spectral reflectance change to the fabric specification (ref a) and that the fabric is, in fact, satisfactory for the end use.

(*Id.* at 5)

119. Following various exchanges of information, government technical documentation, expositions of the parties' respective positions, DB proposals to augment the fabric testing requirements and negotiations relating to the unit price increase for Contract 4031 revised weight suits (R4, tabs 140-150), appellant submitted a third certified claim to the contracting officer on 7 January 2005 (R4, tab 150). The claim sought $628,534 for the increased costs allegedly attributable to the weight range revision (*id.*).

120. Appeals were taken on 15 March 2005 from the contracting officer's failure to issue decisions on the three certified claims, with the appeal related to the Contract 4027 claim docketed as ASBCA No. 54959 and the Contract 4031 claim as ASBCA No. 54960 and the weight range revision claim as ASBCA No. 54961.

The Second Weight Range Revision

121. On 25 January 2005, appellant delivered Lot 3 consisting of 500 suits (the required 440 plus 60 additional suits) produced from 4.8 - 5.0 oz. cloth. The delivery was the first under the revised schedule and was made and accepted two months prior to the scheduled 30 March 2005 due date for the lot. (R4, tab 54 at 3, tab 181 at 63-66) Appellant also requested and received permission to submit a partial lot manufactured from left over cloth from Lot 3 that was insufficient to produce a full lot (tr. 5/98-99).

122. Unilateral Modification No. P00006 was issued by DSCP on 14 February 2005 as an "interim definitization" of Mod. 4 increasing the unit cost per suit (resulting

from the increased material costs for the heavier fabric) by $20.40 pending DCAA and later final definitization (R4, tab 47).[6]

123. On 16 February 2005, partial Lot 4A, manufactured from the left over Lot 3 cloth, was inspected by the government. During the visual and dimensional inspection the government discovered broken stitching around the oxygen tube on one of the suits and rejected the lot. (R4, tab 153; tr. 4/223, 5/97-99) Appellant provided a corrective action plan which was approved on 23 February 2005 (R4, tab 156).

124. In an email of 23 February 2005, Milliken advised DB that Milliken was experiencing difficulty economically manufacturing the fabric within the weight range of 4.8 – 5.0 oz. while complying with the other quality requirements of the specification. Milliken suggested expanding the weight range to 4.6 – 5.0 and that appellant should review the issue with the government. (App. R4, tab 131; tr. 1/207-08, 213, 249-50) Appellant notified the government of the continuing problem with the specification and the need to expand the weight range as recommended by Milliken (R4, tab 157; tr. 1/250-51).

125. DSCP advised appellant on 1 March 2005 that it anticipated that it would have a response to DB's "waiver request" within seven working days (R4, tab 158 at 2).

126. Appellant took issue with the government's characterization of the weight change issue as a "waiver request" insisting that the weight change discussions were only intended as a constructive, cooperative attempt to resolve alleged problems with the specification and eliminate the potential for future fabric ruptures (R4, tab 159).

127. An increment of Lot 4 (consisting of 186 suits) was reworked and was inspected and accepted by the government on 3 March 2005. The scheduled due date for all 440 suits comprising the lot was 30 April 2005. (R4, tabs 54, 160, 178, 181 at 67-69)

128. On 10 March 2005, the government issued Modifications Nos. P00007 and P00008 to Contract 4031 revising the requisite fabric weight range to 4.6 – 5.0 oz. and rescinding Modification No. P00006 that had provided "interim definitization" of the increased cost of the heavier fabric (R4, tabs 48, 49). In a cover letter enclosing the modifications, the contracting officer requested updated pricing information reflecting the cost of 4.6 – 5.0 oz weight range fabric and an "explanation" from appellant regarding government "concerns" that certain required tests to be performed by Milliken were allegedly not conducted. The government also indicated that appellant should not

[6] The final amount due for the increased costs associated with the heavier fabric was addressed in several subsequent modifications but the quantum of the adjustment had not been fully resolved as of the time of trial (tr. 2/201-02, 206-07).

manufacture suits from Milliken's cloth Lot 4 until completion of government verification tests. (R4, tab 160)

The NIR Modifications, Shrinkage Problems and Waiver Requests

129. Milliken's cloth Lot 4 suits failed to pass the shrinkage or "dimensional stability" requirements after washing and appellant was so advised on 14 March 2005. Prior to cloth Lot 4, there is no evidence that Milliken failed to comply with the specification's shrinkage requirements. The average weight of cloth in the lot was 4.6 oz. No further deliveries were made by appellant until August 2006. (R4, tabs 161, 162, 178; tr. 1/253-58, 2/18, 4/223-24)

130. The government issued unilateral Modification No. P00009 (Mod. 9) to Contract 4031 on 15 March 2005. Mod. 9 added the NIR spectral reflectance requirements and related testing to the sage green cloth specification that had been omitted from both of the referenced contracts. (R4, tabs 50, 164)

131. On 16 March 2005, appellant requested a waiver of the shrinkage requirements for Milliken's Lot 4 cloth allowing DB to continue production (app. R4, tab 138).

132. Appellant also notified the contracting officer on 17 March 2005 that DB had been advised by Milliken of the "side-by-side" government testing of the Milliken fabric. Appellant also complained that Mod. 9 would add further testing requirements for spectral reflectance that would also potentially delay production. Appellant considered that the government's verification testing constituted an interference with its contractual relationship with Milliken and was not authorized by Contract 4031. Appellant also stated that it was requesting NCSU's opinion on whether the fabric weight range revisions affected shrinkage. (R4, tab 165)

133. The contracting officer issued unilateral Modification No. P00010 (Mod. 10), dated 22 March 2005, "clarifying requirements under the contract" and reasserting that Mod. 9 remained in effect (R4, tab 51).

134. Appellant was advised by Milliken that DuPont's Nomex production facility was shut down indefinitely at least as of 21 March 2005 (app. R4, tab 142). No written communication from DuPont in the record confirms this shutdown.

135. There was disagreement between the Navy and the AF concerning whether to grant the shrinkage waiver. The Navy considered that it was more important to obtain the suits and that there was little technical risk in granting the waiver. (Tr. 7/204-10) In an email dated 23 March 2005 from Ms. Tara Capecci, the Navy's "Team Leader, Personal Protective Apparel," to cognizant technical personnel in the AF and Navy

(including Ms. Todd and Mr. Huyen), Ms. Capecci made the following comments regarding DB's request for waiver of shrinkage requirements:

> I do not agree with denying the waiver if this will create a backorder situation on the g-suits.
>
> I do agree that the fabric should be retested to verify the results. But if the difference between what is allowed in the spec and the testing is .24 tenths of an inch, I cannot justify to those waiting for a g-suit that we have backorders because the suit fabric shrinks a ¼ of an inch more than it should for every 20 inches of length. They don't wash these suits. I don't think any of you will be able to justify a backorder situation on these suits for this reason either. This has no safety ramifications.
>
> If our management asks why these suits are still backordered, and I tell them about this situation, I feel that I will be told to accept the suits. If necessary, this could be a situation in which the Navy will accept the material and suits made from this fabric lot.
>
> The stance that allowing this waiver will continue to promote a situation in which Derm-Buro feels that they can keep asking for waivers is understood, but I do not see it as reason enough to prevent someone from being able to fly because they cannot get a suit.

(App. R4, tab 147)

136. On 23 March 2005, appellant notified the government of the DuPont shutdown pending completion of repairs to the facility. Appellant advised that it would submit a revised delivery schedule once the plant was operational and it was possible to predict the availability of the fiber. (R4, tab 167)

137. By letters of 24 March and 7 April 2005, the contracting officer notified DB that the alleged DuPont delays were not excusable because DuPont was appellant's subcontractor (R4, tabs 168, 170).

138. On 30 March 2005, the contracting officer denied appellant's requested waiver of the shrinkage requirement for Milliken's cloth Lot 4 (R4, tab 192). However, a retest was authorized (*id.)*.

139. The pertinent specification covers the use of Nomex fabric in 14 different garments not solely in anti-G suits. Shrinkage requirement are most relevant for garments that are laundered regularly. (App. R4, tab 77A; tr. 1/257-58)

140. On 15 April 2005, the government advised DB that Milliken cloth lot 4 had again failed shrinkage requirements on retesting and, therefore, use of fabric from the lot was not authorized (R4, tab 193).

141. Because the government declined to grant a waiver of the shrinkage requirements for the Milliken fabric and Milliken did not consider that it could manufacture the heavier weight fabric and satisfy such requirements, appellant undertook a market survey of other potential vendors. None of the suppliers contacted considered that all specification parameters could be met. (Tr. 1/255)

142. On 19 April 2005, Milliken advised appellant that its cloth production was delayed because of the continuing lack of fiber from DuPont. On 20 April 2005, appellant advised the government of the lack of Nomex and on 21 April 2005, the contracting officer reiterated his position that any DuPont fiber production delays were not excusable. (R4, tabs 172, 195; app. R4, tab 157; tr. 2/41-44)

143. Appellant did not timely deliver the remaining suits due on 30 April 2005 under the existing schedule. On 2 May 2005, Milliken advised DB that its order for the heavier weight fabric (4.6 – 5.0 oz) would not be completed until 5 May 2005 (app. R4, tab 161).

144. Dr. Pegram of NCSU discussed the relationship of the coloration and weight changes to the shrinkage problems in a letter to appellant dated 5 May 2005 (app. R4, tab 162). Although she declined to definitely attribute the shrinkage problem to the other changes, she noted (*id.*):

> Because any type of material or construction changes can potentially affect final properties, it is indeed possible that the increase in fabric weight effected by increasing the picks per inch could change the shrinkage characteristics. It has been shown with other fabrics that increasing the number of picks per inch can impart additional crimp and tension in the warp yarns, which can lead to fabric dimensional instability. However, because we do not know the full chemical and thermal processing history of the aramid fiber (proprietary DuPont formula), we cannot say that this is definitely the primary cause of the excessive shrinkage. The changes in fabric count and weight were introduced to try to correct failures in Destructive Endurance Testing that were observed after changes in the pigment coloration formula in the fibers

> by Government Authorized Modification. These observations illustrate the complex interactive nature of textile materials.
>
> The test method for dimensional stability…exposes the samples to a wash temperature of 60°C (140°F) for 15 cycles. These are very stringent wash conditions and exceed the care label recommendations of the garment, which specify that wash temperature not exceed 120°F. The test method was not designed to be an accelerated method. From our observation of the garment construction and composition, including non-removal air bladders and hoses, it would be unlikely for this garment to be laundered in the fashion implied by the test method. Thus, the shrinkage results produced by the test would not be indicative of what would be observed during the wear life of the garment.

145. On 9 May 2005, appellant again requested a waiver of the shrinkage requirements enclosing Dr. Pegram's conclusions. DB reserved the option of submitting a claim based on the alleged "impossibility/impracticability of consistent commercial manufacturing" of the suits under the defective specifications, as modified under the contract. (App. R4, tab 163)

146. In an additional letter to the government of 9 May 2005, appellant indicated that it was attempting to obtain written confirmation from DuPont acknowledging that its Nomex production plant had been shutdown for eight weeks and that DuPont would require another eight weeks to restart production (R4, tab 173).

147. Appellant advised the government on 24 May 2005 that it had been unsuccessful in obtaining confirmation of the plant shutdown from DuPont but alleged that the government had independent knowledge of the shutdown. DB also proposed a revised delivery schedule conditioned on fabric availability and approval of the shrinkage waiver. (R4, tab 175)

148. On 25 May 2005, the government issued DO 2 under Contract 4031 for 2,400 suits. DO 2 required appellant to deliver a total of 2,400 suits at an average rate of 800 suits per month beginning 1 February and ending 1 April 2006. (R4, tab 60) On 1 and 6 June 2005, appellant notified the government that DO 2 failed to reflect adjustments to DO 1 and the various delays that had been experienced as a result of the alleged defective specifications (R4, tabs 176, 177).

149. On 20 June 2005, the contracting officer informed DB that the shrinkage waiver request had been denied by the AF because of concerns that excessive shrinkage

could cause unacceptable distresses and distortions of the fabric adversely affecting the fit and performance of the suit (R4, tab 200).

150. After the government again denied its shrinkage waiver request on 20 June 2005, appellant asked for further reconsideration of the waiver in a letter dated 22 June 2005. DB reemphasized the alleged nexus between the coloration and weight range changes to the shrinkage issue and Dr. Pegram's remarks relative to the inconsistency between the testing procedures and temperatures and the garment's care instructions. (R4, tab 199)

151. On 30 June 2005, Milliken advised appellant that Milliken was having problems manufacturing revised weight range fabric that would meet the shrinkage requirements (app. R4, tab 188). DB advised the government of the Milliken difficulties on 6 July 2005 (app. R4, tab 189).

152. On 5 August 2005, appellant advised the government regarding its efforts to obtain and qualify another cloth manufacturer to produce the fabric as an alternative to Milliken. Southern Mills agreed to produce test yardage by a projected date of 5 September 2005. In addition, DB notified the government that it had "learned of" an additional alleged specification defect, *i.e.*, "crystallization" (or changes in the crystallinity level) of the DuPont Nomex fiber during DuPont's manufacturing process which may have increased shrinkage rates of the fabric. Appellant enclosed a 3 August 2005 email from NCSU's Dr. Pegram discussing the potential relationship of a change in crystallinity level (if any) to shrinkage. (R4, tab 179)

153. Milliken and DLA lab representatives met to discuss shrinkage issues on 5 August 2005. These discussions were focused on disagreements concerning the appropriate testing methodology to be used in connection with coveralls made with Nomex fabric rather than the anti-G suits. No testimony at the hearing elaborated on the details of issues involved or possible differences in manufacturing or testing procedures for coveralls versus the suits. The Milliken representative considered that excess shrinkage was unrelated to the weight of the fabric but was attributable to DuPont's manufacturing process and DuPont was investigating the matter. (App. R4, tab 200)

154. At some point, the U.S. Army Research Development and Engineering Command (USAREDC) was requested to perform an analysis of the shrinkage issue. On 17 August 2005, USAREDC reported to DSCP that the "tightened weight requirement of 4.6 to 5.0 oz./sq. yd. would not have an effect on dimensional stability. Dimensional stability of Nomex fabric is controlled by heat setting (autoclaving). Excessive shrinkage can result from the lack of autoclaving or the insufficient/improper autoclaving of the fabric. Tightening of the weight requirement could result in a slight increase in tensile and breaking strength." (App. R4, tab 203) Shrinkage can be controlled by proper autoclaving of either the fabric or the fiber (*id.* at 5).

155. DSCP personnel discussed production delays on 8 September 2005. A DSCP memorandum summarizing the discussions noted that, although suits had failed endurance testing, no relevant fabric failures or ruptures had been reported in the field. In addition, the memorandum reported that DLA was completely out-of-stock of all sizes. (App. R4, tab 219)

156. Modification No. P00011 to Contract 4031 was issued on 14 September 2005 approving Southern Mills as a supplier and laboratory for all testing except dimensional stability tests (R4, tab 52).

157. In a 21 September 2005 intra-DSCP memo regarding the status of the shrinkage waiver issue, the contracting officer discussed efforts by the AF to task "an engineer who is going to work on nothing but cleaning up the Anti-G spec. ([The AF representative] wouldn't say who it was…just calling him/her the 'Engineer'…I'm assuming [it's] not Le Huygen [sic]). The scary thing is [the AF representative] said that they were projecting on possibly getting the spec. cleaned up by January (with publication no later than September 2005…yikes!)" (app. R4, tab 227).

158. The contracting officer informed appellant on 26 September 2005 that the shrinkage problems were not excusable noting that even Milliken's lighter weight cloth failed, Milliken was allegedly using the wrong shrinkage test procedures, Milliken conceded that the weight change had not affected shrinkage, and improper autoclaving likely caused the problems. With respect to appellant's alternative crystallization theory, the contracting officer considered the issue to be a supplier problem not a specification defect. (R4, tab 201)

159. On 27 September 2005, the contracting officer approved a deviation from the shrinkage requirements to permit appellant to produce 3500 suits because of the supply shortage. The letter enclosed three unilateral modifications: Modification No. 0001/05 providing for the deviation and Modifications No. 0001/06 and 0002/01 revising the delivery schedules for DO 1, DO 2, respectively. As revised, appellant was to deliver the remaining quantity under DO 1 in six monthly increments of 875 suits beginning in April 2006 and a final increment of 114 on or before 30 October 2006. The revised schedule for DO 2 required deliveries of 761 suits on or before 30 October 2006, 875 by 30 November 2006 and 764 by 30 December 2006. (R4, tabs 58, 59, 61, 200, 202)

160. Appellant acknowledged receipt of the modifications on 30 September 2005 but again asserted that the "root cause" of problems and delays was the DuPont "coloration change". DB indicated that the delays were excusable and questioned the reasonableness of the unilateral schedule revisions. (R4, tab 203)

161. In a 4 November 2005 memorandum, the Navy's Ms. Todd stated (R4, tab 209 at 6-9):

> 15. Despite the test results that indicate that the NIR spectral reflectance change does not explain the failures observed in Lot 55, NAWCAD urges that DSCP fully coordinate and verify any future specification changes with the component suppliers (in this case, the fiber producer, weaver, and finisher) as well as with the cognizant Engineering Support Activities and all Users of the specification. The lack of contractor and subcontractor confidence in this case would likely have been avoided had the specification change been fully coordinated with them.

Additional Delays

162. DB's manufacturing facilities were damaged by Hurricane Wilma on 24 October 2005. The Hialeah facility and cutting operations were more adversely impacted than the Clearwater plant. (R4, tabs 207, 212)

163. On 25 October 2005, appellant sent samples of pre- and post-"coloration change" fabric to Dr. Krishna Parachuru at the Georgia Institute of Technology (GIT) for testing (app. R4, tab 316; tr. 7/336-39).

164. On 8 November and 14 November 2005, appellant advised the contracting officer that DuPont, according to Milliken and Sothern Mills was experiencing "quality problems" and a "complete shade failure" forcing it to stop production of Nomex and was also shutting down for a week of scheduled maintenance (R4, tabs 210, 213). Appellant emphasized that DuPont was the sole source of the specified fiber and had delayed shipments pending resolution of the problems and completion of maintenance (R4, tab 210).

165. In a memorandum dated 9 November 2005, Mr. Huyen noted that "DSCP stopped the testing [of DB Lot 55 under Contract 4027] due to Derm Buro's discovery of the cause of the failures [the "coloration change" per the Pegram study]" and that the four "untested" samples were returned on 31 March 2004 and received by DB on 5 April 2004 (app. R4, tab 237).

166. On 28 November 2005, appellant notified the contracting officer that Southern Mills was projecting that it would not receive Nomex from DuPont until January 2006. Given the problems in obtaining Nomex, the production time for manufacturing the cloth and suits, appellant considered the unilateral delivery schedule to be "unrealistic" (R4, tab 215).

167. On 1 December 2005, the contracting officer requested documentation, *inter alia*, verifying delays attributable to the DuPont production problems and the hurricane (R4, tab 216).

168. Milliken advised appellant on 6 December 2005 that Nomex production had been delayed in late October and early November 2005. As a consequence, Milliken anticipated that DB's December fabric shipment would be delayed until late January or early February 2006. (R4, tab 217) Appellant notified the government on 9 December 2005 of the DuPont delays, stated that DuPont refused to provide documentation acknowledging its production difficulties, and proposed that when fabric became available that the government consider a limited temporary relaxation of endurance testing requirements or authorize the use of the tan fabric to expedite manufacturing of the suits (R4, tab 219). The contracting officer forwarded the latter two options to the AF and Navy for review. On 18 January 2006, the contracting officer notified appellant that the options were rejected as not viable. (R4, tab 220)

169. DuPont admitted to the contracting officer on 20 December 2005 that it had encountered Nomex production problems in March/April 2005 for "1-2 weeks" relating to "supply issues" and October/November 2005 for "3-4 weeks" relating to a "coloration issue." DuPont also indicated that it has two yearly scheduled shutdowns for maintenance. (App. R4, tab 244) We find that DuPont production problems and delays concurrently delayed performance of Contract 4031 for a total of 42 days in March/April and October/November 2005.

170. On 21 December 2005, the Navy issued its own version of the specification for the suits (app. R4, tab 246). On 24 March 2006, the AF issued its "cleaned up" version of the specifications (app. R4, tab 256).

171. On 25 January 2006, DSCP solicited proposals for the suits with offers due on 3 February 2006. DB was not solicited and requested a copy of the solicitation on 2 February 2006 which DSCP forwarded on 14 February 2006. (App. R4, tab 252) DSCP made award to Mustang Survival Management, Inc. (Mustang). On 17 February 2006, DB filed a protest with the (now) Government Accountability Office (GAO) alleging that the specifications were defective and appellant was improperly excluded from the competition (R4, tab 224).

172. On 6 March 2006, Southern Mills was approved as a laboratory for dimensional stability testing pursuant to Modification No. P00012 (R4, tab 226).

173. On 13 March 2006, appellant complained of government delays performing correlation testing on samples of Milliken Lot 5 cloth and Southern Mills Lot 1 fabric that had allegedly been in the possession of the government since 23 January and

10 February 2006, respectively. Until government tests were satisfactorily completed and appellant could proceed with production of the suits using the fabric, appellant indicated that it was delayed. (R4, tab 227)

174. On 23 March 2006, the government notified appellant that Milliken had not provided its test results until 14 February 2006 and had failed to complete all requisite tests until 17 March 2006, whereupon Lot 5 was approved by the government. The government also advised that it had not received any Southern Mills Lot 1 fabric as alleged by appellant. (R4, tab 229)

175. Noting that satisfactory cloth was now available from Milliken, the government requested, on 29 March 2006, that DB provide a revised delivery schedule (R4, tab 231; app. R4, tab 258).

176. In its 29 March 2006 response to DSCP's agency report in the GAO protest, appellant advised DSCP that its manufacturing facilities in Hialeah and Clearwater were fully repaired and operational after the hurricane damage. It also stated in a later GAO filing that it had made deliveries of suits under a foreign military sales contract from its Hialeah facility beginning in November 2005. (App. R4, tab 224 at 14-15, 31-32) Although there is conflicting evidence on the issue, we find that appellant would have been capable of recommencing production under Contract 4031 in mid-January 2006 if acceptable cloth had been available but was concurrently delayed 70 days by the hurricane damage from 24 October 2005 to mid-January 2006. Because the hurricane-caused delay overlapped with the DuPont plant shutdown delays (finding 169), we further conclude the that total additional delay attributable to the hurricane was 56 days. (*id.*; tr. 2/220-23, 228-36, 6/85-86).

177. On 30 March 2006, appellant advised that it was not yet able to provide a reasonable delivery schedule. DB cited, *inter alia*, prior alleged government delays and the conflicting test reports of the government and Milliken. (R4, tab 231)

178. On 3 April 2006, appellant alleged that the government had failed to timely advise Milliken that its tests were incomplete for approximately 30 days after their receipt. With respect to Southern Mills cloth Lot 1, DB asserted that Southern Mills had contacted the government lab on 6 February 2006 and was told that no correlation testing would be performed but was later told on 15 March 2006 to submit verification samples for correlation testing. (R4, tab 232)

179. On 1 May 2006, DSCP advised GAO that it was terminating the contract awarded to Mustang and was reassessing its needs with respect to the suits. DSCP stated that appellant would be solicited if and when the suits were resolicited. On 2 May 2006, GAO dismissed the protest as academic. (App. R4, tab 259)

180. On 7 April 2006, appellant proposed a schedule for delivery of 3500 suits contingent on government approval of Milliken Lot 5 and Southern Mills cloth Lot 1 by 14 April 2006. The proposed schedule called for deliveries of 500 units per month for seven months beginning 31 August 2006 and ending 28 February 2007. (R4, tab 233)

181. On 19 April 2006, appellant inquired as to the status of government verification testing of Southern Mills cloth Lot 1 and was advised by DSCP on 20 April 2006 of approval of the lot (R4, tabs 234, 236 at 2).

182. Unilateral Modifications No. 0001/07 and 0002/02 under Contract 4031 were issued by DSCP on 18 May 2006 extending the dimensional stability deviation to 31 December 2007 for DOs 1 and 2, respectively (R4, tabs 241, 242).

183. Also on 22 May 2006, the contracting officer requested that appellant provide a revised delivery schedule without contingencies by 26 May 2006 (R4, tab 245).

184. By letter dated 24 May 2006, appellant complained of government delays in performing verification tests and inquired concerning special handling requirements or procedures for end items produced with the deviation (R4, tab 246). By separate letter to the government of the same date, appellant emphasized the difficulty of providing a reasonable schedule in four days given the extensive delay and considered that a contingency was necessary if DSCP required more than its estimated 30 days to complete verification tests (R4, tab 247).

185. By letter of 5 June 2006, the contracting officer indicated that appellant was not required to wait for "verification testing approval before it is permitted to accept shipments of component lots from its vendors (with the exception of shade evaluation which is acceptance testing)" (app. R4, tab 263). According to the government any prior direction not to proceed pending completion of verification tests was specific to Milliken cloth Lot 4. With this advice, the government requested that DB furnish a revised delivery schedule immediately by the date of the letter. (*Id.*)

186. Appellant took issue with DSCP's assertion that appellant could proceed without awaiting the results of government verification tests in a letter of 7 June 2006. Appellant quoted an internal DSCP memorandum relating to Milliken cloth Lot 5 indicating that prior government approval was required before acceptance of the cloth and commencement of DB's manufacture of the suits with the cloth. (App. R4, tab 264)

187. On 8 June 2006, appellant provided the contracting officer with a delivery schedule "without contingencies." Deliveries under DO 1 were to commence on 31 August 2006 and end 30 April 2008. Deliveries under DO 2 were scheduled to begin 28 June 2008 and end 28 February 2009. (R4, tab 253)

Awards to Other Contractors

188. On 12 June 2006, the government issued an individually numbered DSCP Form 33 "Solicitation and Offer" to appellant and two other offerors, Mustang and Switlik Parachute Company (Switlik) (R4, tabs 314, 319; app. R4, tab 265). Each solicitation sought offers for suits under the revised AF and new Navy specifications (app. R4, tab 265 at 11-22 of 71). Appellant alleged that there were problems with the specifications and requested patterns and drawings referenced therein (R4, tab 261, 263). As a consequence, the government extended the closing date for submission of offers (originally 26 June 2006) by appellant (*id.*).

189. On 14 June 2006, DSCP issued bilateral Modifications No. 0001/08 and 0002/03 under DO 1 and 2, incorporating the Contract 4031 delivery schedules proposed by appellant on 8 June 2006. Neither modification provided for a price increase or contained a release of claims. There is no evidence of negotiations or a mutual intent to resolve appellant's claims or the referenced appeals. (R4, tabs 254-56)

190. Also on 14 June 2006, DSCP notified appellant of the completion of satisfactory "shade acceptance" and verification testing of Southern Mills' Lot 2 cloth. The notification again advised appellant that it could proceed with manufacturing operations without awaiting the results of the verification tests. (R4, tab 257)

191. On 20 June 2006, appellant emphasized that, because the pertinent specification provided that the government's correlation "test results will be used for acceptance/rejection purposes," it was reasonable for DB to await conclusion of the correlation tests before starting its fabric cutting and other manufacturing operations (R4, tab 259). Pending satisfactory completion of the government tests, ordering fabric and manufacturing would have been at DB's risk (tr. 2/94, 5/25).

192. DSCP awarded contracts to Switlik and Mustang on 7 July 2006. There is no evidence that DSCP extended the 26 June 2006 closing date for Mustang and Switlik as it had for DB. The awarded contracts required the manufacture and delivery of 2,656 suits under the revised AF specification and 394 suits under the new Navy specification. (R4, tabs 316, 321) The contract lot sizes were substantially smaller than 500 per month and the delivery schedules were more extended. The contracts incorporated, *inter alia*, the spectral reflectance tables, the second weight range revision, and relaxed shrinkage requirements discussed above. The revised specifications also required inspection of the endurance testing model to insure it was free of nicks, splinters and imperfections as well as a requirement in the AF specification that the model first be "dressed" with a coverall before attaching and fitting the suits to the inanimate model. (App. R4, tabs 264, 264A, 265, R4, tabs 313, 314, 316, 319; tr. 1/259-61, 2/265-67, 5/13-18, 21-23, 146-47, 7/198-99, 201) At the time of the hearing, Switlik was delivering approximately 100 suits per production lot (tr. 5/21-23). Despite the reduced delivery requirements and

specification revisions, both Switlik and Mustang experienced workmanship deficiencies and at least one test failure, although not a fabric rupture (tr. 5/87, 92-93, 130-31; R4, tab 323). As of the time of the hearing in April 2007, only approximately 1,000 units under each contract were scheduled to have been delivered (R4, tabs 316, 321).

193. On 13 July 2006, DSCP notified appellant that Milliken cloth Lot 6 had failed the government's verification tests for shrinkage. However, because of the shortage of suits, DSCP indicated that it would "accept" the lot (consisting of 4,026 yards) and waive the failure as a "Minor (Type II) nonconformance" for $43.00. (R4, tab 264)

194. On 12 July 2006, DB notified the government of alleged conflicts between the drawings and patterns supplied by the government at DB's request and the specifications. Appellant, unaware of the prior awards to Mustang and Switlik, requested an indefinite postponement of the closing date for offers pending review and resolution of the conflicts. (R4, tab 263) In response to the government's 17 July 2006 request (R4, tab 267), appellant provided a preliminary listing of perceived problems with the specifications, patterns and drawings (R4, tab 269).

195. As of 26 July 2006, the government had not reviewed and responded to appellant's listing of conflicts. Therefore, appellant requested that they be timely addressed before the closing date for offers or appellant would protest the terms of the solicitation. In addition, appellant requested copies of the other solicitations (to Mustang and Switlik) that appellant was now aware had been issued. (R4, tab 276)

196. On 2 August 2006, the government furnished appellant with copies of the contracts issued to Mustang and Switlik. DSCP indicated that all three solicitations had been issued and contracts later awarded to Switlik and Mustang pursuant to the authority of 10 U.S.C. 2304(c)(3) as implemented by FAR 6.302-3 providing for an "industrial mobilization" exception to competition requirements. DSCP also forwarded the contract award notices that it had submitted to FedBizOpps on 7 July 2006. (R4, tab 280)

197. On 23 and 29 August 2006, appellant again complained about the government's delayed response to its technical inquiries related to the alleged conflicts within the drawings and specifications, emphasizing in particular that the delays would potentially impact DB's ability to obtain cloth and other suit components pending correction given its competitors' orders (R4, tabs 287, 290).

198. The government responded to appellant's technical inquiries by letter of 13 August 2006 and established a closing date of 1 November 2006 pursuant to a solicitation amendment (R4, tab 292). Appellant advised the government on 5 September 2006 of continuing alleged unresolved deficiencies and their effect on

timely and economically ordering components for the manufacturing of the suits (R4, tab 294).

199. On 13 December 2006, the contracting officer advised appellant that Milliken's cloth Lot 8 had failed shrinkage tests. This failure was deemed a "minor (Type II) nonconformance" by the government. Therefore, DSCP considered the fabric to be acceptable for use by DB under a waiver requiring that DB reimburse the government $758.50. (R4, tab 360)

The Bladder Issues and Appellant's Performance to Date of Trial

200. On 29 December 2006, appellant's end item Lot 7 was presented for testing. One of the sample suits failed destructive endurance testing, rupturing on the inside abdomen area. (R4, tab 365) A government QAR present during the test considered that the bladder was too large causing the fabric rupture (tr. 5/60-67).

201. By letter to the government dated 5 January 2007 setting forth its corrective action response (CAR), appellant stated that Lot 7 suits had been manufactured in accordance with the specifications and that DB considered the fabric failure to be attributable to the same cause as the prior ruptures. Appellant requested permission to resubmit the suits for retesting. (R4, tab 367)

202. On 30 January 2007, the contracting officer advised appellant that its CAR was considered inadequate, contained no suggestions for improvement, and offered no reasonable cause for the failure. The contracting officer requested recommendations to prevent recurrences. (R4, tab 371)

203. Appellant responded on 1 February 2007 stating that it had disassembled the failed suit and found no manufacturing deficiencies. It emphasized that it had completed previous lots under Contract 4031 successfully and considered the Lot 7 failure to be an anomaly. (R4, tab 372)

204. On 14 February 2007, appellant indicated that Lot 8 would be submitted for testing on 28 February 2007 (R4, tab 374) and again requested permission to retest Lot 7 (R4, tab 375).

205. On 21 February 2007, the contracting officer notified DB that its CAR, as revised, was "unsatisfactory." The letter advised that the government had performed tests on appellant's Lot 6 suits and concluded that the bladder material's weight and seams did not conform with specification requirements. Therefore, the contracting officer asked DB

to verify that the Lot 7 bladders complied with the specifications.[7] (R4, tab 376; app. R4, tab 299)

206. Lamcotec had submitted a certification to DB indicating that the bladder materials complied with specification requirements (app. R4, tab 314; tr. 2/140-41).

207. As of the time of trial in April 2007, appellant had delivered at least 1,576 suits pursuant to DO 1 under Contract 4031 (findings 76, 121, 127; tr. 2/150-51). That number is supported by DD Forms 250 (Material Inspection and Receiving Report) in the record for the first four lots. There is also evidence that appellant successfully completed delivery of Lot 5 (on 31 August 2006) and Lot 6 (on an indeterminate date) prior to the Lot 7 rupture. The government does not dispute their delivery and the government's acceptance. (R4, tabs 285, 286, 289, 309) However, the Lots 5 and 6 deliveries are not supported and verified by DD Forms 250. Since the inception of the fabric ruptures in August 2003, appellant also had delivered Lots 53 (resubmission), 56 (resubmission), 57, 58, 59, 60 and 61 (remanufactured). At peak production under Contract 4027, prior to the failures, appellant was capable of consistently producing approximately 1,000 suits per month (tr. 1/150-153, 2/152). [8]

[7] Issues regarding the bladder weight had surfaced on 6 February 2002 when Mustang, in the midst of extensive production problems under a contract predating those in dispute, wrote to the government discussing, *inter alia*, a modification issued by DSCP on 5 October 2001 allowing use of heavier than specified bladder material furnished by Lamotec that was also appellant's supplier of the bladder material. The letter noted that another manufacturer had also been producing heavier than specified bladders and that Lamotec had been providing the same material to DB for "the past few years" and that the alternate bladder producer was also supplying only overweight bladders. (App. R4, tab 297)

[8] After the hearing of these appeals, both DOs issued under Contract 4031 were terminated by the government for default on 31 May 2007. Appellant timely appealed the terminations, docketed as ASBCA Nos. 56106 and 56107. The parties jointly requested that proceedings be suspended pending issuance of this Opinion.

Expert Reports and Testimony

208. Dr. Perry L. Grady is the Associate Dean and Professor of Textile Engineering, Chemistry and Science at NCSU's College of Textiles and has served in that capacity since 1987. He has been employed by NCSU in various capacities since 1962. Dr. Grady has received numerous awards and has authored nearly 100 technical publications and books in the field of textiles. He has broad and extensive experience, and was accepted by the Board as an expert, in that field. (App. R4, tab 294; tr. 2/293-320)

209. Dr. Grady submitted an expert report regarding the relationship between the DuPont "coloration change" and the fabric ruptures experienced by appellant during endurance testing. In his opinion, the "coloration changes" made to the "building block" fiber by DuPont, reduced the ability of fabric manufactured from the fiber to resist rupture and was the most probable cause of the ruptures. (App. R4, tab 294; tr. 3/46-47, 75-77, 84, 95, 120-22, 161-64)

210. Dr. Grady detailed how the addition of pigments and chemicals to meet the unwaived specification NIR spectral requirements in March 2002 materially altered the formulation of the pre-change fiber blend. The resulting variation in the chemical, physical and mechanical properties of the fiber/fabric prevented the suits from consistently passing the endurance tests. (App. R4, tab 294, Dr. Grady's "Summary Points"; tr. 3/27-35) Dr Grady considered that the government should have thoroughly tested the effects of the fiber "coloration change" to the fabric and the final product, *i.e.*, the anti-G suits before it was actually used for their manufacture (tr. 3/39-41, 85). Dr. Grady stated (tr. 3/95-96):

> [B]ut I think you can see the polymers are the building block of the fiber and how they're put together. The fibers are the building block of the yarn, and then the yarn is the building block of the fabric, and the fabric is the building block of the garment.
>
> So any time you make a change in that basic element, actually, any time you made a change in either the fiber, the yarn structure, the fabric structure, or how you put the garment together, any of those could affect what's happening, but if you make this change at the very elemental part, the fiber, then you're definitely going to run the risk of making changes in the final performance of the fabric breaking down, and changes in the performance of the yarn.

> They may be small, and they may not necessarily be reflected in strength but rather flexibility and things like that, particularly since you're doing a (sic) endurance test.

211. Dr. Grady's opinions were based in part on his own analysis and that of three earlier university studies of the effects of the fiber "coloration change": Dr. Pegram's analyses described earlier (concluding that the "coloration change" adversely impacted the abrasion resistance properties of the fabric); a State University of New York (SUNY) at Stony Brook study by Dr. Benjamin S. Hsiao; and, a GIT study by Dr. Radhakrishnaiah Parachuru (app. R4, tab 294). He emphasized that all three of their studies independently confirmed that the "coloration change" significantly changed the properties of the fabric. He agreed with their conclusions that the changes in the properties studied were particularly significant in a "high performance" product. (Tr. 3/100-01)

212. Dr. Hsiao's SUNY study was based on small angle X-ray scattering (SAXS) and wide angle X-ray diffraction (WAXD) analyses of pre- and post-"coloration change" fabric samples. Dr. Hsiao concluded that the "chemical/coloration change" introduced by DuPont significantly altered the crystallite structure of the fiber and fabric. He and Dr. Grady considered that the changes may have reduced the total crystallinity of the fiber thereby weakening it and the fabric resulting in the endurance test failures. (App. R4, tab 294; tr. 3/31-34, 37, 41, 79-95, 161-62)

213. Dr. Parachuru's study found that the "coloration change" materially altered the fabric structure and properties relative to flexibility and "bursting strength." He concluded that the post-change fabric was substantially weaker in terms of tensile, tear and bursting strength. These substantially weaker properties imply that the fabric weakness was related to weakness of the fibers themselves. (App. R4, tab 294; tr. 3/43-44, 47-64, 71, 73-77)

214. Dr. Grady also indicated that increasing fabric weight does not necessarily increase its strength and may have the unintended consequence of making it easier, not harder, to tear. He also stated that manufacturing a fabric with a weight range of 4.3 to 5.0 oz./sq. yd. was radically easier than manufacturing within the "tight" range of 4.8 to 5.0. According to Dr. Grady, there is a direct relationship between the closeness of the yarn and the degree of shrinkage. Consequently, heavier weight fabric with yarns closer together tend to shrink more than lighter weight fabric. (Tr. 3/61-62, 67-72, 102-10)

215. With respect to Dr. Pegram's conclusions from her abrasion tests, Dr. Grady agreed with Dr. Pegram that abrasion testing best simulated stresses to the fabric experienced during the endurance tests. It was a standard testing method that could reasonably assess the relative abrasion resistance characteristics of the pre- and post-change fabric. He considered that the tests were highly relevant to an assessment of

the fabric's ability to withstand endurance testing because during the tests the suits were being abraded on one side by the test apparatus/model and on the other side by the expansion and contraction of the bladder. (App. R4, tab 294; tr. 3/96-98, 224-25) In contrast, the relative tenacity (strength) of the pre- and post-change fiber (tested by DuPont) was not the most important property in assessing the likelihood of fabric rupture (tr. 3/39, 77, 84, 95-96).

216. Dr. Grady also emphasized that the tan fabric outperformed all of the green fabrics in Dr. Pegram's tests which supported the conclusion that coloration (and changes therein) generally affects fabric wear and properties (tr. 3/99-100).

217. Dr. Grady considered that it was entirely possible for some post-change suits to pass while others failed due to the many variables in any fiber-based product. In his opinion, the "coloration change" in the fibers would affect the number of failures but would not cause all of the suits to fail all of the time. (Tr. 3/114-20)

218. According to Dr. Grady, adverse impacts of the changes to the chemistry of the fabric may only be apparent in the final product (the suits), in particular because the suits were the only Nomex-based garments that were subjected to the endurance tests (tr. 2/14-15, 3/100-02).

219. In Dr. Grady's opinion, endurance testing using the rigid and bare test model specified in Contracts 4027 and 4031 was more severe than using the overall-clad soft mannequin used by the Navy in its May 2004 tests (tr. 3/112-13, 254).

220. The government offered the testimony of two experts: Ms. Todd and Ms. Carole Winterhalter. Ms. Todd is a Physical Scientist for the Flight Clothing Team at the Naval Air Warfare Center, Patuxent River, Maryland and has served in that capacity since 1996. She earned a Bachelor of Science in Fashion Design, Minor in Chemistry from Florida State University in 1987 and a Master of Science in Clothing and Textiles from Virginia Polytechnic Institute and State University in 1991. Ms. Winterhalter has served as a Textile Technologist, at the Warfighter Science, Technology and Applied Research Division, U.S. Army Soldier Research, Development and Engineering Center since 1987. She earned a Bachelor of Science in Textile Technology from the University of Massachusetts in 1981 and a Master of Science in Textiles from NCSU in 1985. She has been involved, *inter alia*, in the drafting of cloth specifications including MIL-C-83429, is the co-holder of two patents and has two patent applications pending. Both Ms. Todd and Ms. Winterhalter have authored numerous publications and have earned numerous awards. (Ex. G-1 at 15-30, ex. G-2 at 17-23) Both Ms. Todd and Ms. Winterhalter were accepted as experts by the Board in the areas discussed in their reports (tr. 5/255-56).

221. Ms. Todd found no conclusive evidence that that the post-change fabric caused the failures (tr. 7/30). She considered that manufacturing deficiencies, nonconformities, and poor workmanship were the likely causes of the failures, in particular those associated with the bladders (tr. 7/30-31, 35-36).

222. Ms Todd weighed samples of bladder cloth from various lots delivered by appellant. She determined that all of the samples exceeded the allowable weight range specified, including bladder samples taken from suits in failed lots 37, 53 and 56 (under Contract 4027) and in at least two suits produced in 2001. Test reports submitted by Lamcotec, appellant's bladder supplier, support the conclusion that it supplied overweight bladders to appellant. (Ex. G-2, attachs. 2, 5; R4, tab 324 at 2, 8, 14, 20, 26; tr. 6/109, 205, 227-244)

223. Ms Todd also examined the bladder seams of sampled suits delivered by appellant to determine if the seams exceeded allowable tolerances. She found that 16 of the 40 sampled exceeded the allowed tolerance. (Ex G-2, attach. 2; tr. 6/238-40) In her opinion, the excessive seams could adversely and unpredictably affect the suits' ability to satisfy testing requirements (tr. 6/109, 183, 205, 227-244).

224. There are seven sizes of bladders with each size having its own drawing. For each bladder size, the drawings depict nine sewing tabs which are to be sewn into the seam of the aramid shell and four additional tabs which assist in positioning the bladder during the manufacturing process. During her examination of the sampled suits, Ms. Todd found extra sewing and positional tabs for certain size suits that were not shown in the drawings. In Ms. Todd's opinion, the extra tabs could have rubbed against the aramid shell increasing the stress on the cloth during endurance tests and caused the rupture. (Ex. G-2 at 8-9, attach. 4; R4, tab 383; tr. 6/176-77, 183-89, 193-98, 209, 217, 230-244)

225. Ms. Todd noted that there were extra tabs in the failed Lot 37 and Lot 55 suits that were endurance tested under Contract 4027 (tr. 6/210). As noted in our findings above, Lot 55 passed endurance testing but failed the post endurance leakage test due to a small separation of the weld along the hose which was not related to any deficiencies in the bladder. We have found that the Lot 37 failure was caused by nicks, spurs or the rough surface of the model on which the suit was strapped. The government knew of the alleged extra bladder tabs contemporaneously at the time of testing and raised no contemporaneous concerns that they may have contributed to the failures (R4, tab 81, tr. 7/70-72).

226. Ms. Todd found the university tests included in Dr. Grady's expert report unpersuasive as to the cause of failure because in her opinion the fabric samples used in testing were too limited for valid testing (tr. 6/255, 265-67, 7/225-26). There is no persuasive evidence in the record supporting Ms. Todd's opinion that the various

university researchers reached their result using insufficient or otherwise deficient fabric samples.

227. Ms. Todd performed no tests designed to investigate any causal relationship between any of the defective bladder and other poor workmanship issues discussed in her report and the ruptures in dispute. All suits examined by Ms. Todd were from lots that passed, *inter alia*, endurance testing and were accepted by the government. Suit sizes that failed the endurance tests had conforming bladders. (Tr. 7/56, 59-62) Ms. Todd did not examine any of the suits that failed endurance testing although she conceded that analyzing those suits would have been more appropriate in determining the cause of failure (tr. 6/186, 7/48-51, 74-75, 213, 300). There is no evidence that the government analyzed any of the failed suits other than the examinations conducted by Mr. Huyen in 2004 or as occurred at the time of lot submission, inspection and testing.

228. Ms. Todd's analyses were conducted in late 2006 or early 2007 and appellant was first advised of the alleged deficiencies associated with the bladders and other deficiencies noted by Ms. Todd in February 2007, shortly before the trial of these appeals. Appellant used the same bladder materials under all of its prior contracts. (App. R4, tab 299; tr. 1/155, 2/137-48, 7/174) There is no evidence that the government considered that alleged deficiencies associated with the bladders caused or contributed to the fabric ruptures in dispute prior to December 2006 (tr. 7/177). In its March through May 2004 testing, the Navy subjected suits with allegedly non-compliant bladders to 10,000 cycle endurance tests without failure (tr. 7/76).

229. Ms. Todd considers that the effects of the "coloration change" should have been tested and coordinated with the fabric and garment manufacturers prior to implementing the change (tr. 7/184-87).

230. Ms. Winterhalter did not consider that appellant's expert report and university analyses established that the "coloration change" caused the ruptures (tr. 7/52-53). In particular, she emphasized that appellant's testing was focused on the fabric when it should have been concentrated on changes in DuPont's fiber resulting from the "coloration change" (tr. 7/273, 281-82, 286). She noted that DuPont's fiber tenacity tests concluded that there were no differences between the strength of the pre- and post-change fibers in DuPont's opinion (tr. 7/274-76, 316-17, 321). Ms. Winterhalter conducted no tests comparing the characteristics of pre- and post-change fibers (tr. 7/35). The government also conducted no tests on the pre- and post-change fibers following the ruptures. There is no evidence that pre-change fiber was available for comparison on or after the point when the government first disputed appellant's conclusion that the "coloration change" caused the ruptures.

231. Ms. Winterhalter opined that the differences in crystallinity noted in the SUNY analysis may have been within DuPont's acceptable manufacturing variations.

However, she conceded that she was not privy to DuPont's proprietary crystallinity range. (Tr. 7/274-76)

232. According to Ms. Winterhalter, fabric shrinking can be controlled in manufacturing the fabric and the "coloration change" did not contribute to the fabric shrinkage problems experienced by Milliken (tr. 7/292, 303-04).

233. Ms. Winterhalter stated that abrasion testing is not required by military specifications because of the variability and unpredictability of tests results among test laboratories and even when conducted by the same laboratory. Therefore, she considered the NCSU test results reported by Dr. Pegram to be unreliable. (Tr. 7/277-80, 325-28; ex. G-1) Ms. Todd concurred in this assessment, noting in particular that NCSU used two different testing machines and more than one operator which could have adversely impacted the reliability of the reported results (tr. 7/27-29; ex. G-2 at 13-14, attach. 10). However, Ms. Todd conceded that flex abrasion testing was a valid method to determine the relative abrasion resistance characteristics of the pre- and post-"coloration change" fabric, if the tests were properly administered (tr. 7/27-29).

DECISION

Appellant alleges: 1) the specifications were defective; 2) the government changed the specifications; 3) the government withheld superior knowledge; 4) the government breached the implied duty of good faith and fair dealing; 5) the government's changed specifications made performance commercially impracticable; and 6) the government is barred by estoppel/waiver principles from alleging that any deficiencies associated with the bladders caused the ruptures. We consider that the contract was changed by the government's requirement to use the post-change fiber and that the "coloration change" caused the fabric ruptures increasing the cost and time of performing both contracts. Therefore, we need not address appellant's alternative theories for recovery.

I. The Change

The contracts were constructively changed by the government's knowledge, approval, and authorization of DuPont's "coloration change" to the fibers from which the cloth and end item suits were manufactured. In this case, the specifications of both referenced contracts (as well as predecessor contracts performed by appellant) did not include an NIR or spectral reflectance requirement for the sage green suits involved in this dispute. Appellant successfully delivered approximately 60,000 suits (findings 4, 34) without relevant failure under contracts incorporating those specifications (including the instant contracts) between 1992 and August 2003. During that time period, the sole source manufacturer of the fibers (DuPont) could not produce fibers satisfying the NIR characteristics sought by the government. Consequently, the fabric manufactured from

the fibers and the suits manufactured using the fabric did not possess the desired NIR characteristics prior to 2002-2003. However, DuPont continued its research and in 2002 eventually produced experimental fibers that met the government's spectral reflectance needs. In so doing, DuPont altered the chemical composition of the fiber thus changing the "building block" fiber materials from which the aramid fabric and suits were manufactured. The alteration is referred to by both parties as the "coloration change" and the fabric manufactured from the fiber as the post-"coloration change" fabric.

DSCP accepted DuPont's "coloration change" to the fiber without analysis or testing by the AF or Navy of the resultant fabric or suits manufactured from the fiber. At no time has DSCP contended that DuPont introduced the "coloration change" unilaterally or without authorization.[9] Moreover, the government consistently endorsed use of the post-"coloration change" fiber and recognized it as a change to these contracts (see *e.g.*, findings 73, 106). In fact, DSCP expressly incorporated the change with the issuance of Mod. 9 under contract 4031 (findings 130, 133). That modification formalized the government's prior constructive adoption of the new fiber and attendant revisions of the specification's NIR requirements under both contracts. The government's authorization and directions to use the new sole source fiber, with changed spectral reflectance characteristics, constructively changed the specification. *Cf. Astro Dynamics, Inc.*, ASBCA No. 28381, 88-3 BCA ¶ 20,832 at 105,364-65.

II. Consequences of the Change

The primary issues in these appeal relate to whether the change caused the fabric ruptures and resultant lot rejections. Assuming an affirmative answer to the latter question, there are disputes concerning the extent of delays and other adverse consequences attributable to the change.

A. The "Coloration Change" Caused the Failures

We are persuaded based on the totality of the record and the preponderance of the evidence that the "coloration change" caused the fabric ruptures experienced by appellant. That change reduced the ability of the cloth and suits to withstand destructive

[9] Because the government has consistently acknowledged that the "coloration change" was authorized and that it directed the change to these contracts, we need not address issues related to ratification. As emphasized herein, the government contentions in these appeals focus on causation issues, *i.e.*, whether the "coloration change" caused the fabric ruptures and the extent to which appellant was delayed and adversely impacted by that change as opposed to other factors. There is no argument that the "coloration change" was unauthorized or not directed. There is also no contention that deficiencies or inconsistencies in DuPont's manufacturing of the fibers caused the ruptures experienced by appellant.

endurance testing. It also materially increased the time and cost of performing these contracts. In particular, we emphasize appellant's highly successful performance history prior to introduction of the changed material, the contemporaneous agreement of the parties that the changed fiber caused the failures, and the expert analyses further establishing causation. We also have considered and find unpersuasive: the government's criticisms of appellant's analyses, the government's own analyses and expert opinions, as well as the assertion that appellant's problems were attributable to poor workmanship or material deficiencies. We also reject the government's contentions that the alleged success of two other manufacturers demonstrates that the ruptures were attributable to appellant's deficient performance.

1. Appellant's Successful Pre-Change Performance History

Prior to the Lot 53 rupture under Contract 4027 in August 2003, appellant had successfully produced and delivered over 25,000 suits under eight prior contracts and another approximately 32,000 suits under Contract 4027 itself. The "coloration change" was the only proven (or alleged) material revision of the specifications occurring prior to the onset of the ruptures. In addition, no other relevant changes in the manufacturing processes of appellant or its suppliers or in the materials incorporated into the suits have been proven. During the preceding decade of appellant's successful production, there is no evidence of suits rupturing during testing. [10]

The fact that appellant also had limited success in producing suits with post-"coloration change" fiber/fabric does not detract from our conclusion that the sporadic ruptures were caused by the "coloration change." Appellant could not produce the suits on a sustained, consistent and continuous basis without reoccurrence of the ruptures. As found by Dr. Grady, it was entirely possible that the change would increase the number of failures with some post-change suits passing while others failed endurance testing (finding 217). Failure of all tests and production lots was not a prerequisite to recovery for the delays and increased costs attributable to lots that did fail. *Cf. Astro Dynamics, Inc.*, ASBCA No. 28320, 83-2 BCA ¶ 16,900. Proof that the specifications were impossible to perform is not required where the evidence supports the conclusion that the change increased the time and cost of performance.

Appellant's successful manufacturing and testing of tan suits tends to confirm that its testing problems were related to fiber pigmentation generally and not to workmanship deficiencies (finding 216). The ruptures were confined solely to the post-change sage green fabric.

[10] The Lot 37 failure was caused by surface imperfections of the mannequin and was dissimilar to the ruptures in dispute in these appeals (finding 32).

2. Initial Contemporaneous Agreement on Causation

Following the Lot 55 rupture in October 2003 (finding 44), appellant delivered suits, fabric, other materials and supplier certifications to the Air Force for testing and analysis of the ruptures. In the meantime, appellant learned of the "coloration change" and independently contacted NCSU to analyze whether the post-change cloth differed significantly from pre-change fabric. In February 2004, Dr. Pegram of NCSU advised appellant that the post-change fabric exhibited materially lower abrasion resistance qualities and concluded that this was a probable cause of the ruptures. The government was furnished with the results of the study and, in March 2004, the Air Force technical engineering representative concurred with that conclusion. Consequently, the Air Force discontinued its testing and analysis and returned the suits, materials and documentation to appellant. (Findings 64, 68)

At least as late as November 2005, the Air Force lead technical representative continued to express that the "coloration change" caused the endurance test ruptures (finding 165). Although the Navy was not the cognizant service responsible for technical oversight of specification issues, it undertook its own investigation and also initially agreed that the "coloration change" caused the ruptures (finding 65). Thereafter, the parties discussed methods of overcoming the problem with the government eventually twice tightening the specified fabric weight range in the belief that heavier fabric would be less prone to rupture. If the government considered that the "coloration change" did not adversely affect the ability of the suits to withstand endurance testing, there would, of course, have been no reason to implement the weight range revisions.

3. Expert Analyses By Appellant

We further consider that the most persuasive expert evidence on causation in the record is that presented in Dr. Grady's report and his hearing testimony. He concluded that the most probable cause of the ruptures was the "coloration change" (finding 209). In reaching that conclusion he relied in part on the results of three other analyses by academic researchers concluding that the post-change fiber or fabric exhibited significantly different characteristics that may have adversely contributed to the ability of the suits to consistently pass endurance tests and caused the ruptures. We have considered the numerous government criticisms of appellant's expert analyses and find them unfounded or without merit.

The government repeatedly points out that Drs. Pegram, Hsaio and Parachuru did not testify. It then devotes much of its technical challenge to dissecting and questioning the methodology and conclusions set forth in their studies. Dr. Grady's report and the NCSU, SUNY and GIT studies, that were an integral part thereof, were admitted into evidence without objection by the government. At no time did the government request the presence of the researchers conducting the studies at trial to explore the details of the

data and assumptions underlying their analyses. If the government considered the studies to be flawed, it should have required Drs. Pegram, Hsaio, and Parachuru to testify, introduce and defend their analyses. Absent timely and appropriate objection, we have weighed the expert analyses, including that of Dr. Grady, and have found them cumulatively persuasive when considered in light of all evidence of causation in this case.

The government has elected to impeach appellant's studies for the most part with its own post hearing interpretations and independent analyses of their import. Its exceedingly technical criticisms were not fully developed or adequately explained in the evidence. For the most part, we do not consider in this case that the government has clearly laid an adequate technical foundation to challenge the conclusions of the expert studies included in Dr. Grady's report. For example, the government contests Dr. Parachuru's conclusion that the post-"coloration change" fabric had lesser tensile, tear and bursting strength. Essentially the government carves out subsets of Dr. Parachuru's underlying data, reanalyzes and compares that data and concludes that Dr. Parachuru misanalyzed his own test results and, therefore, reached incorrect conclusions. There is simply no basis for rejecting Dr. Parachuru's conclusions based on the speculative government assumptions made in the government's briefs.

A primary government criticism of the SUNY and GIT studies is that sufficient quantities of pre-change cloth were not used. Any absence of pre-change cloth for use in the studies is mainly the fault of the government. Initially, government technical personnel agreed that the "coloration change" caused the failures. There was no reason for appellant to retain substantial quantities of pre-change cloth. By the time that appellant was reasonably on notice that the cause of the ruptures remained controversial, it had shipped the pre-change cloth lots retaining only minimal quantities and endurance-tested suits. The government also had pre-change cloth in its inventories but did not offer to conduct joint expert tests. It elected to conduct only its own in-house tests. Appellant did the best it could with available pre-change material under the circumstances.

Similarly, government theories that fabric samples were taken from stressed areas of endurance tested suits are purely speculative. We do not consider that the University researchers conducting the studies would have used unrepresentative or inappropriate samples absent more persuasive proof. Again, the government should have insisted on cross examination of the authors if it wished to press this point.

With respect to the flex abrasion tests performed by Dr. Pegram, the government does not question their merit or relevance in determining the cause of the ruptures. It challenges the reliability of abrasion test results generally, alleging that they are highly unpredictable and variable as a result of differences among testing laboratories and personnel. The government's contentions are speculative. There is no evidence that Dr. Pegram's abrasion tests were not carefully and competently conducted or that her

results were distorted to the government's prejudice. In addition, the significant differences in the relative flex abrasion properties of the pre- and post-change fabric were corroborated by Milliken's tests. Moreover, the government could have simply conducted joint tests with appellant eliminating or minimizing potential variables that might skew results.

4. Government Testing and Expert Opinions

The government points to analyses by its experts and test results conducted predominantly in 2004 and in 2007. The 2004 analyses by the Navy (and eventually set forth in the AF Trammell Report) concluded that appellant had not proved that the change caused the fabric ruptures, but found no evidence of poor workmanship and did not identify what the government considered to be the cause. The second series of government analyses were performed by Ms. Todd in early 2007 and concluded that the likely cause of failure was appellant's defective workmanship, emphasizing in particular perceived deficiencies of the bladder and/or appellant's alleged failure to comply with sewing tolerance requirements related to the fabric surrounding the bladder.

Before addressing the 2004 and 2007 test results, the Board considers that the record is remarkable for the lack of government testing prior to implementing any of the changes involved in this appeal, including not only the "coloration change" but the ensuing weight range revisions intended to ameliorate adverse effects of the "coloration change" (findings 27, 109). The only relevant testing prior to introducing the new fabric involved tenacity tests performed on the pre- and post-change fibers by DuPont. Noticeably absent were any tests designed to assess the effects of the "coloration change" on either the fabric manufactured from the fibers or the suits manufactured using the fabric (finding 27). There is no disagreement that such tests should have been conducted to assess whether significant variances in the performance characteristics of the final product might occur. Apparently in this case, the using services were not even provided an opportunity to comment on possible consequences of the "coloration change" prior to DSCP's authorization to use the changed fibers in manufacturing the fabric and suits. According to Dr. Grady, changes on a "high performance" garment like the suit may have adverse effects that only manifest themselves, and then perhaps only sporadically, in the final product. A primary consequence of the omission of testing was that appellant effectively served as a "guinea pig." Instead of simply producing the suits as it had done without problems for a decade, appellant was effectively required to test and verify the feasibility of the changes under these mass production supply contracts.

We also emphasize that neither the 2004 nor the 2007 government tests involved careful examination and analyses of suits, fabric and/or components of suits that actually failed. The suits that failed in late 2003 were originally sent to Mr. Huyen. They were returned to appellant several months later after only visual and dimensional inspection and after Mr. Huyen had concurred with appellant's conclusion that the cause of failure

was the "coloration change." Neither the Navy nor the Air Force requested the return of the failed suits for further analysis.

a. The 2004 Tests

The government's tests in mid-2004, culminating in the August 2004 Trammel Report, reached no conclusion as to the precise cause of the ruptures. They merely questioned the soundness of appellant's conclusion that the "coloration change" was the source of the problem. According to the Navy and AF, which eventually used the results of the Navy tests, there were no significant differences in the performance of the pre- and post-change cloth. The 2004 tests largely replicated fabric tests required to be performed by the fabric manufacturer to insure specification compliance. Those government tests were not designed, *inter alia*, to detect material changes in the chemistry of the pre- and post-change fiber. To the extent that the tests focused on abrasion resistance, the Navy's Mr. Bryan found that the post-change cloth was less resistant to abrasion than the pre-change fabric but that the difference was not material in his view (finding 104).

Even after the tests were completed, the AF's Mr. Huyen continued to be of the opinion that the failures were attributable to the "coloration change." Moreover, DSCP twice revised the weight range for the cloth. If the government considered that the "coloration change" had no impact, there would have been no reason to make those changes to the specification.

One major component of the Navy's 2004 tests was endurance testing. The government emphasized that the pre- and post-change suits were subjected to as many as 10 times the specified number of inflations without failure. Therefore, the government concluded that the "coloration change" had not weakened the fabric. However, those tests were not conducted in the specified manner. The mannequin used in the tests was softer and significantly different than the hard model required to be used by appellant. In addition, the Navy's mannequin was fitted with a coverall before mounting the suits. (Finding 109) We agree with Dr. Grady's conclusion that the 2004 tests with the clothed, soft mannequin were significantly less severe than those conducted using the specified hard model (finding 219). As a minimum, the noncompliant test dummy was a major deviation from the required testing methodology, introducing a new variable in the testing regimen with unproven comparative effects.

After the Trammel Report was issued, the Navy conducted additional analyses of the fabric. These analyses disclosed that some of the suits delivered and accepted under Contract 4027 were manufactured from pre- and post-change fabric that was slightly below the minimum weight (finding 114). All of the lots from which the suits were selected had passed endurance testing as well as other pre-acceptance tests and examinations. Why the reduced weight was not discovered or reported earlier by Mr. Huyen, the AF, the Navy during their earlier examinations, or by DSCP prior to

acceptance is not clear. The post-acceptance weight measurements were taken independently by the Navy, not the AF, without participation by appellant or Milliken. In any event, no correlation between the allegedly underweight fabric and the test ruptures was established. In addition, Dr. Grady and the record support a conclusion that increasing the fabric weight may actually decrease the ability of the suits to pass the endurance tests, despite the subsequent weight range revisions by the government. As we understand the government's position at the time of briefing, it does not claim that underweight fabric was the cause of failure. Its proof and expert reports at the hearing focused on bladder and other workmanship deficiencies based on its 2007 tests discussed below.

In summary, we consider that the 2004 tests and government analyses are most significant for what they did not find—evidence of poor workmanship that allegedly could have caused the failures. The government investigators and reports consistently confirmed the lack of any such evidence including the lead engineer for the AF, the service charged with technical oversight issues. Mr. Huyen in fact was the only government investigator who was in full custody of the ruptured suits (among others) for several months and was furnished all pertinent documentation, including vendor reports. This conclusion was also reached despite intense and considerable focus on, and inspection of, appellant's manufacturing operations, materials and quality control program. (Findings 15, 35, 43, 71, 106, 108)

b. The 2007 Tests

Shortly before the trial of these appeals, the Navy's Ms. Todd inspected and analyzed suits in the government's inventory, focusing on the bladders and surrounding fabric. Between August 2004 and completion of the Navy's investigation in 2007, the government considered that, since it could find nothing materially wrong with the fiber and fabric, the ruptures must pertain to an unidentified manufacturing problem attributable to appellant. On the other hand, the government twice changed the fabric weight range suggesting that it considered that those revisions would resolve possible problems with the fabric. The 2007 investigations of Ms. Todd sought to more precisely identify and define specific manufacturing deficiencies that contributed to the ruptures.

Ms. Todd concluded that the bladders were overweight and often not cut to pattern. In her view, the tolerances specified for sewing the fabric surrounding the bladder also were often exceeded. One or more of these defects may have caused the failures in her opinion. We have considered Ms. Todd's analyses of the deficiencies but find them unpersuasive in defining the cause of the ruptures.

Fundamentally of course, all of the suits tested by Ms. Todd came from passing lots. No attempt was made to inspect suits that did not pass the endurance tests. At best

for the government, any deficiencies identified by Ms. Todd had no demonstrated relationship to the ruptures.

In addition, the contractor had no reported problems with ruptures during more than a decade of production prior to the "coloration change" (other than the Lot 37 failure attributed to test model surface imperfections). All pre-change suits passed the endurance tests over that extended period of performance under multiple contracts. It would have been a remarkable coincidence for poor workmanship to begin causing failures at the same time as the introduction of post-change fabric. As emphasized above, not only were manufacturing deficiencies not earlier and more contemporaneously identified, appellant's facilities and operations were thoroughly inspected, particularly after the onset of the failures. The government considered poor workmanship issues over an eight month investigation period culminating in issuance of the Trammel Report. Presumably, if there were workmanship problems that may have caused the failures, the government would have identified and focused on them before 2007.

We also note that the record supports a conclusion that overweight bladders had been accepted and incorporated into the suits for an extended period, apparently pursuant to waivers, without causing fabric ruptures. The government also focused on the bladders during their 2004 investigations and drew no conclusion that they were the source of the problem.

Although the record supports a conclusion that poor workmanship and supplier issues concurrently delayed appellant's performance to an extent as we discuss below, deficiencies in appellant's manufacturing operations have not been proven to have caused the ruptures.

5. Alleged Success of Other Manufacturers

The government contends that if the DuPont "coloration change" had weakened the fabric causing ruptures to occur during endurance testing, other manufacturers also would have experienced ruptures. The ruptures were specific to appellant. Consequently the cause(s) of the failures were specific to appellant, according to the government.

The 2006 Mustang and Switlik contracts are not comparable to appellant's contracts in numerous respects. Both contractors were in the early stages of production under their 2006 contracts at the time of the hearing. Their 2006 contracts were dissimilar in size and volume. Appellant had successfully produced approximately 60,000 suits for ten years without ruptures, and as many as 1000 or more per month, prior to the "coloration change" and the onset of the failures in 2003. The quantity to be delivered under each of the Mustang and Switlik contracts totaled only approximately 3,000 to be delivered in monthly production lots that were significantly smaller.

The 2006 contracts incorporated specification revisions and waivers that evolved over several years of experimentation and were eventually instituted under Contract 4031. The two new "industrial mobilization" contracts contained "cleaned up" AF and new Navy specifications that are materially dissimilar to those set forth in Contract 4027 and 4031 as awarded. Fabric shrinkage waivers were also granted by the government. The two newly-mobilized contractors benefited from several years of appellant's trial-and-error attempts to resolve problems and manufacture the suits. To the extent that the endurance testing under the Mustang and Switlik contracts was conducted using a clothed and softer testing model, there was a material difference in the testing specifications. (Finding 192) Any associated endurance test results under the new contracts are not comparable to those experienced by appellant under the contracts in dispute.

Moreover, we have noted that the ruptures were unpredictable. There were post-change periods where appellant successfully produced multiple consecutive production lots. For example, over an approximate one month period, appellant successfully completed delivery of 2,132 suits (lots 57 through 60) under contract 4027 (finding 48) *i.e.*, approximately two-thirds of the entire deliverable quantity under the Mustang and Switlik contracts. It later delivered lots 1 through 6 under contract 4031 despite the "coloration change" and continuing unresolved specification and waiver issues (finding 207).

In addition, the government's characterization of the performance of the newly mobilized contractors as unqualifiedly successful is not accurate. Although they may not have experienced the same types of testing failures, there were material reported deficiencies in their work as of the date of trial. This limited performance history is insufficient to establish that the two new manufacturers successfully mass-produced the suits on a sustained, continuous basis without deficiencies or failures even under the specifications as revised and with waivers.[11]

[11] Under cover of a letter dated 28 February 2008, the government filed a "Request to Reopen the Record" (Request) pursuant to Rule 13(b) seeking to introduce two affidavits from contracting officers administering the Mustang and Switlik contracts. The affidavits purport to provide an update on the status of those contracts and the successful continuing performance of the contractors since the time of the hearing. On 25 March 2008, appellant filed its "Opposition" to the Government's Request. We deny the government's Request. As we have emphasized herein, we consider that there remain significant differences between the specifications, size and volume of the contracts, as well as the prior performance history of the contractors. The contracts and contractors are not sufficiently similar. Moreover, as the government acknowledges, the record was formally closed at the conclusion of the hearing (tr. 7/375) as provided for in Rule 13(b). The government failed at any time to request that the record remain open

B. The "Coloration Change" Caused Extensive Delays

The "coloration change" also caused delays in performance of these contracts which we now address.

1. Contract 4027

The Contract 4027 schedule for the second option year required completion of deliveries by 26 November 2003. As of that date, appellant had delivered all required lots with the exception of the quantity associated with failed Lot 55. Eventually, that final lot was reworked (for a second time) and redesignated Lot 61. It was delivered and accepted by the government on 24 June 2004 completing all requisite deliveries under the contract (finding 93). We consider that delays occurring during the entire period from 26 November 2003 through 24 June 2004 were solely caused by the "coloration change" and the ensuing investigation of the reasons for the endurance test ruptures. Although Lot 55 twice failed due to a workmanship issue unrelated to the ruptures in dispute (findings 37, 44), it was subsequently reworked (redesignated Lot 55B) and redelivered on 18 November 2003. But for the failure of the lot as a result of a fabric rupture during endurance testing (finding 49), all suits under Contract 4027 would have been timely delivered. Accordingly, appellant is entitled to a time extension and an equitable adjustment to compensate it for the 211 days of delay encountered during the period 26 November 2003 through 24 June 2004.

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for the purpose of updating the progress of Mustang and Switlik. To reopen the record at this late stage as a minimum would require further discovery permitting appellant full opportunity to explore and test the statements made in the affidavits. In addition, appellant would be further prejudiced if it was not afforded the opportunity to present rebuttal evidence that may entail, *inter alia*, reconvening the hearing and full opportunity to cross-examine the affiants.

2. Contract 4031[12]

General Conclusions

The delay issues for resolution in connection with Contract 4031 are atypical for several reasons. As of the time of the hearing, problems caused by the "coloration change" were allegedly continuing. Consequently, the evidence before us is inadequate to assess the nature, extent and/or concurrency of these continuing delays. There is no readily determinable date in the record to establish the end of the delay and thus measure the total delay attributable to the change. Moreover after the hearing, the contracting officer issued two final decisions terminating delivery orders under Contract 4031. Pursuant to the parties' joint request, we suspended proceedings in the two resulting appeals pending issuance of this opinion. Given these factors and the pendency of the appeals relating to the terminations for default, we consider that issues associated with determining the precise extent of the delay should be remanded to the parties for negotiation with the following guidance in computing the equitable adjustment.

First, we conclude that all delays in delivery of lots under the contract through 31 December 2006 were caused in whole or in part by the "coloration change" and thus were excusable. Appellant is entitled to a commensurate time extension. In this regard, we have concluded that appellant was capable of producing 1,000 suits per month but for the "coloration change." In addition, we note that none of the contract modifications extending lot delivery dates addressed appellant's pending claims. There was no meeting of the minds or understanding that the claims were released therein. *Cf. Metric Constructors, Inc.*, ASBCA No. 46279, 94-1 BCA ¶ 26,532 at 132,058 (claim for

[12] The government asserts that the Board lacks jurisdiction over "many of appellant's grievances," mentioning in particular the revisions of the weight range and shrinkage issues arising during performance of Contract 4031 (gov't br. at 114-17). It contends appellant should have filed additional claims and sought further contracting officer's final decisions with respect to those matters. In the government's opinion, they are not part of the "operative facts" of the "coloration change" claims and appeals (*id.* at 115-16). The government's views of the scope of the "coloration change" claims and the associated appeals are too narrow. Appellant contends and we have found that the weight revision and shrinkage issues were part of the chain reaction of events that flowed from the "coloration change." In these appeals appellant was required to prove the number of days delay caused by that change. Recognizing the alleged relationship, the parties have tried and argued extensively about its delaying consequences. Appellant is not seeking segregable relief for the weight range revisions and shrinkage problems in these appeals. It alleges and has proved that those problems were part of the "coloration change" delays and impacts and thus within the scope of the operative facts of the associated claims and appeals.

equitable adjustment in board appeal not abandoned, waived or released in contract modification).

Second with respect to the monetary adjustment due appellant, delays caused by the change were concurrent, to a limited extent, with other causes of delay for which the government was not responsible. Specifically, we have found that appellant was concurrently delayed by the hurricane for 56 days and the DuPont plant shutdowns for 42 days. In addition, there were a few isolated and minor instances of defective workmanship contributing to the delay that are specifically noted in our findings. In their deliberations on remand, the parties should consider a further minor reduction in computing the amount of the monetary adjustment due appellant to reflect these few instances of poor workmanship identified in this opinion. *See, e.g., William F. Klingensmith, Inc. v. United States,* 731 F.2d 805, 809 (Fed. Cir. 1984).

The parties may also consider the impact of our findings and conclusions herein on the propriety of the terminations for default. We note that, to the extent any termination for default was improper and should be converted to one for the convenience of the government, the pricing of the equitable adjustment may be relevant in the pricing of the termination settlement and possible adjustment of the contract price. *Cf., e.g., Safeco Insurance Company of America*, ASBCA No. 52107, 03-2 BCA ¶ 32,341 at 160,016-17, 160,022-24; *Worsham Construction Co.*, ASBCA No. 25907, 85-2 BCA ¶ 18,016 at 90,369.

The Weight Range Revisions and Shrinkage Issues

In its attempts to preclude further ruptures, the government issued two changes to the specified weight range for the fabric. It also eventually led to a waiver of specified shrinkage requirements. Both weight revisions resulted from the "coloration change" but did not succeed in remedying the fabric rupture issues, leading instead to excessive shrinkage of the fabric.

The government contends that the weight range revisions were implemented at appellant's request and, therefore, the government apparently considers that it was not solely responsible for their consequences and resulting delays. The government also maintains that both revisions of the weight range remained within the originally-specified 4.3 to 5.0 oz. range, justifying implementation of the weight revisions without testing.

Regardless of whether it was reasonable for the government to assume that appellant possessed the expertise to make complex technical judgments concerning potential impacts of changing the weight range, the suggestions DB made were not adopted by the government in any event. In a cooperative attempt to resolve the rupture problem, appellant suggested revising the weight range to 4.8 to 5.2 oz. (finding 75). That range was expressly rejected by the government. Instead, the government opted to

revise and tighten the range to 4.8 to 5.0 oz. following deliberations within the AF and Navy. The services considered the latter range "would work better" (finding 78). Appellant was not responsible for the consequences of that misjudgment. The weight range revisions were the result of extensive discussions by government technical personnel resulting in the government's unilaterally modifying the contract in each instance. (Findings 78, 79, 83, 88, 90, 94)

After the contract was modified to incorporate the 4.8-5.0 weight range revision, it proved to be impracticable to consistently manufacture the "high performance" fabric within the 4.8 to 5.0 oz. range. The government did confer with Milliken regarding the feasibility of the narrow range. Milliken's initial assessment, however, proved overly optimistic in actual practice after it retooled its operations attempting to comply. The record reflects that the government was well aware of the potential manufacturing difficulty presented (findings 81, 84, 85, 91). There is no contention by the government that Milliken was at fault for its inability to consistently mass produce the fabric within the very narrow 4.8-5.0 oz. range.

We do not consider that appellant was concurrently responsible for delays attributable to these experimental, mid-stream revisions of the specifications under its manufacturing contract. Again no tests or thorough analysis of the feasibility or potential consequences of the weight range revisions were performed by the government prior to unilaterally modifying Contract 4031. Manufacturing the fabric within the narrow range on a high volume basis had not been attempted previously. Appellant's contractual undertaking did not include research and testing of possible solutions. There is no evidence that appellant had the expertise to knowingly assume the risks associated with the government's experimental revision or that it contracted to do so. Presumptively, that technical expertise was in the government. Although the urgent need for the suits may have justified the need to require appellant to manufacture the suits "on-the-fly" without adequate testing of the changes, Derm/Buro was entitled to the increased costs and time associated with its efforts. We note also that the government concedes that it is responsible for the increased cost associated with producing the fabric within both revised weight ranges. We see no reasonable basis to deny appellant recovery of other costs and impacts of the revisions.

We further consider that the adverse impacts of the weight revisions need not be segregated from the overall adverse chain of consequences flowing from the "coloration change." The weight range issue was also expressly mentioned in appellant's detailed 19 October 2004 explication of its claims under each contract (finding 116) which was expressly incorporated into the claims that were submitted on 25 October 2004 (finding 117). Accordingly, issues pertaining to the weight revisions may be addressed and resolved in ASBCA Nos. 54959 and 54960. Although the subsequent 7 January 2005 claim (finding 119) and associated appeal, ASBCA No. 54961, also sought costs attributable to the initial tightening of the weight range, that claim is fully redressable

under the earlier docketed appeals and no segregation of costs as between the "coloration change" and weight revision change is necessary. The adverse consequences of the weight range revisions overlap with and were sufficiently linked and causally-related to the chain of operative facts encompassed by the "coloration change" claims. Therefore, ASBCA No. 54961 duplicates relief sought under, and is subsumed within, the earlier two appeals.

However, appellant must share some of the responsibility for delays associated with the shrinkage of the fabric during the period after implementation of the second weight range revision. The record supports a conclusion that shrinkage is substantially controllable, *inter alia*, during the fabric manufacturing process. Milliken, appellant's principal fabric supplier, experienced significant difficulties in satisfying the shrinkage requirements. In contrast, Southern Mills, appellant's alternate supplier, did not experience the same problems. There is no explanation for the disparity in the ability of the two fabric suppliers to control shrinkage. Therefore, we conclude that appellant was concurrently delayed by Milliken's inability to meet the shrinkage requirements without waivers. However, in assessing the delay attributable to Milliken's concurrent shrinkage problems and waivers, we again recognize the difficulties inherent in implementing changes in a manufacturing environment without prior testing of their impacts. We also recognize the additional time appellant expended to find and qualify an alternate approved source for the fabric during performance of this manufacturing contract. On balance and considering the entire record, we conclude that appellant was concurrently delayed an additional 50 days by shrinkage issues for which it remained responsible.

In summary, appellant is entitled to a time extension under Contract 4031 to be determined on remand and in accordance with our guidance above. It is also entitled to a monetary adjustment to compensate it for increased costs attributable to the "coloration change," including the cost impacts associated with the compensable delay.

CONCLUSION

ASBCA Nos. 54959 and 54960, involving Contracts 4027 and 4031, respectively, are sustained to the extent indicated herein. Those appeals are remanded to the parties for negotiation of the equitable adjustment due appellant under each contract. The claim in ASBCA No. 54961 is part of the operative facts associated with the "coloration change" and the adverse consequences causally linked to that change. We have fully addressed and resolved the "coloration change" claims under both contracts in ASBCA Nos. 54959 and 54960. Accordingly, ASBCA No. 54961 is subsumed within the two earlier-numbered appeals and is dismissed as duplicative.

Dated: 27 May 2009

ROBERT T. PEACOCK
Administrative Judge
Armed Services Board
of Contract Appeals

I concur

MARK N. STEMPLER
Administrative Judge
Acting Chairman
Armed Services Board
of Contract Appeals

I concur

EUNICE W. THOMAS
Administrative Judge
Vice Chairman
Armed Services Board
of Contract Appeals

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. 54959, 54960, 54961, Appeals of Derm/Buro, Inc., rendered in conformance with the Board's Charter.

Dated:

CATHERINE A. STANTON
Recorder, Armed Services
Board of Contract Appeals