

# Appendices

## Appendix A: Dynamic Response of an Aluminum Plate

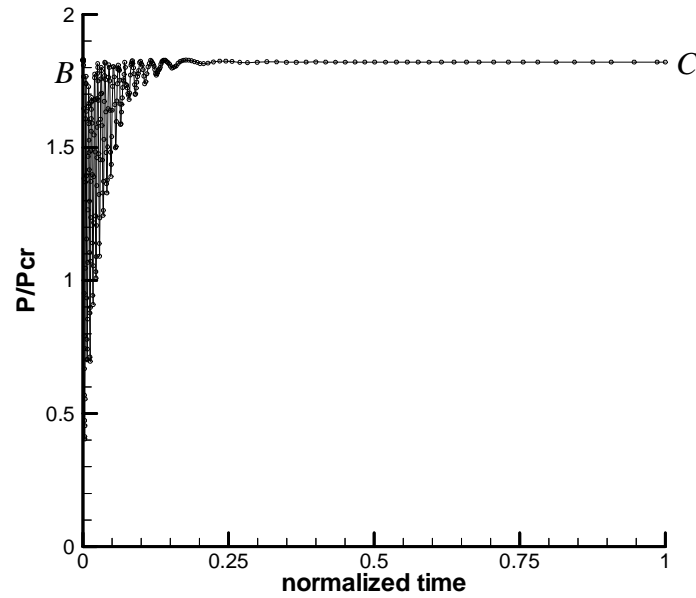


Fig. A.1 1st transient load response of an aluminum plate (CL-CL)

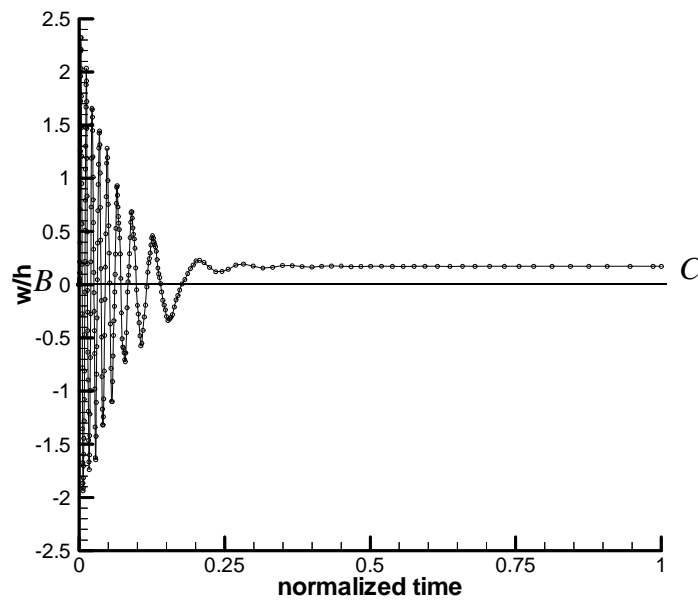


Fig. A.2 1st transient response at II of an aluminum plate (CL-CL)

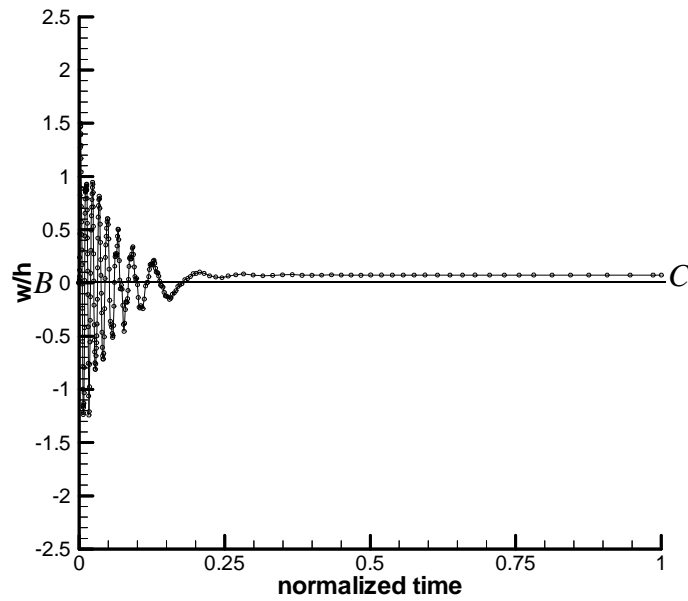


Fig. A.3 1st transient response at III of an aluminum plate (CL-CL)

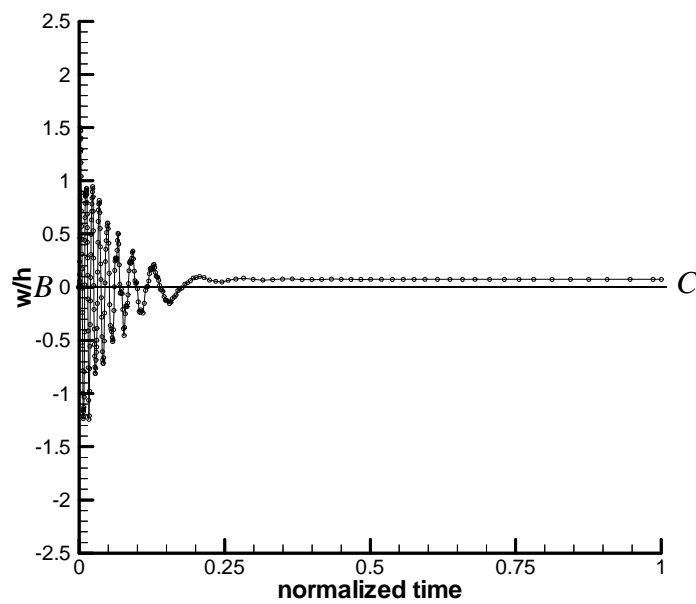


Fig. A.4 1st transient response at I of an aluminum plate (CL-CL)

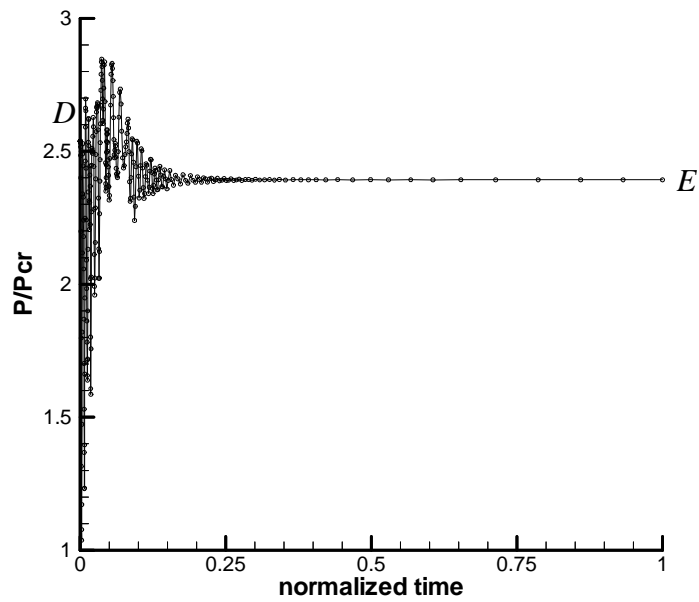


Fig. A.5 2nd transient load response of an aluminum plate (CL-CL)

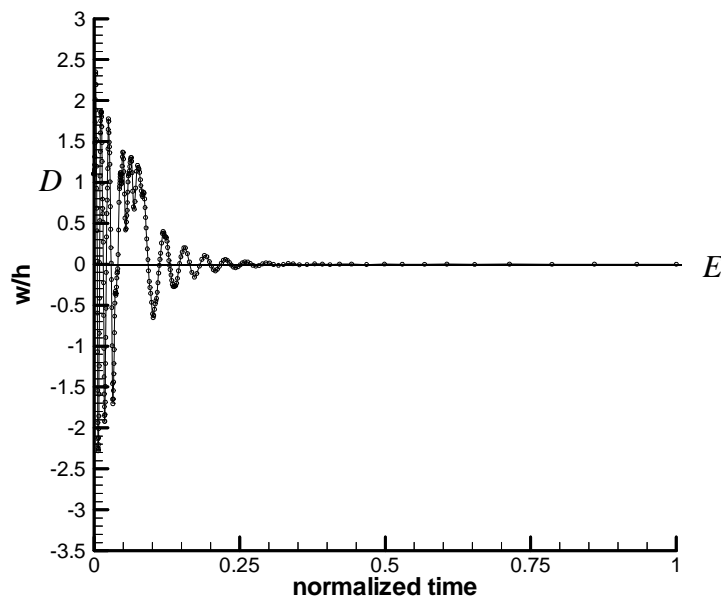


Fig. A.6 2nd transient response at II of an aluminum plate (CL-CL)



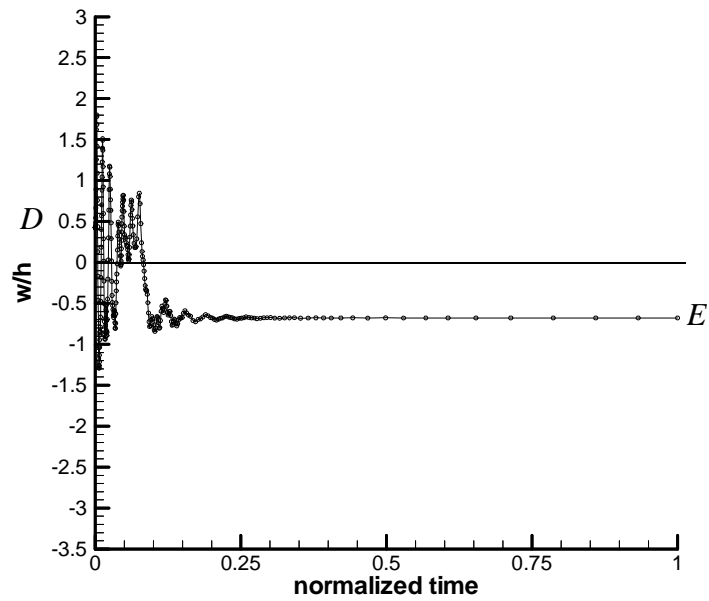


Fig. A.7 2nd transient response at III of an aluminum plate (CL-CL)

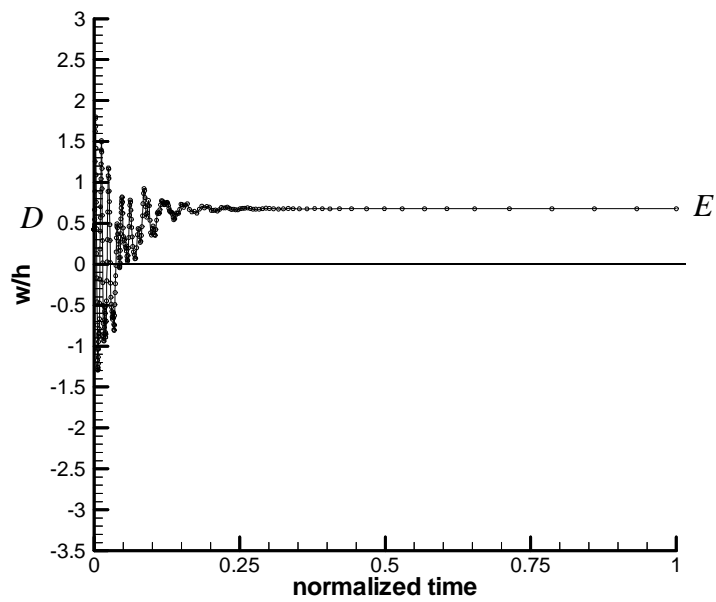


Fig. A.8 2nd transient response at I of an aluminum plate (CL-CL)

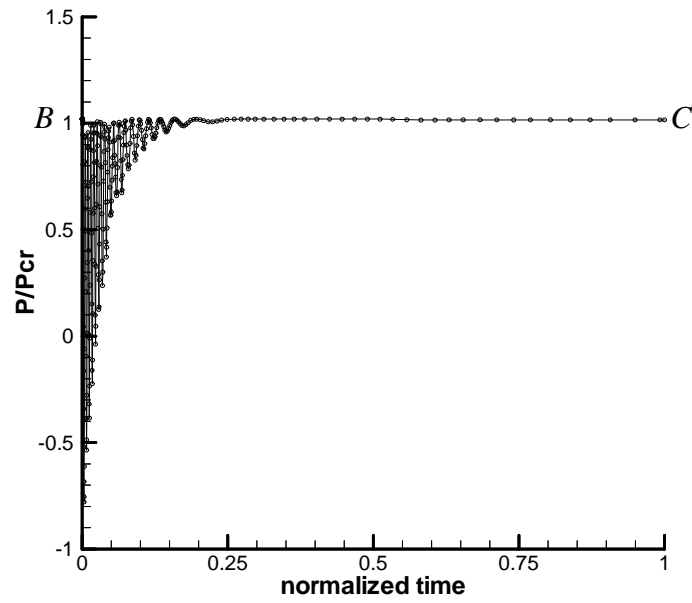


Fig. A.9 1st transient load response of an aluminum plate (CL-SS)

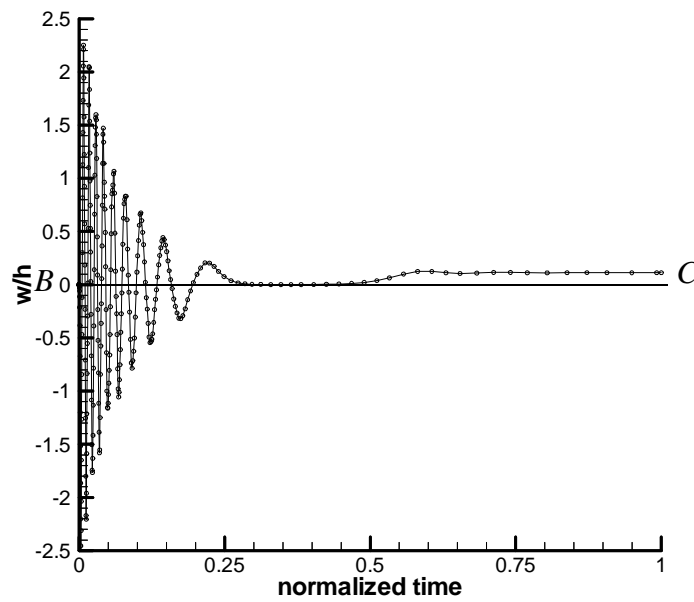


Fig. A.10 1st transient response at II of an aluminum plate (CL-SS)

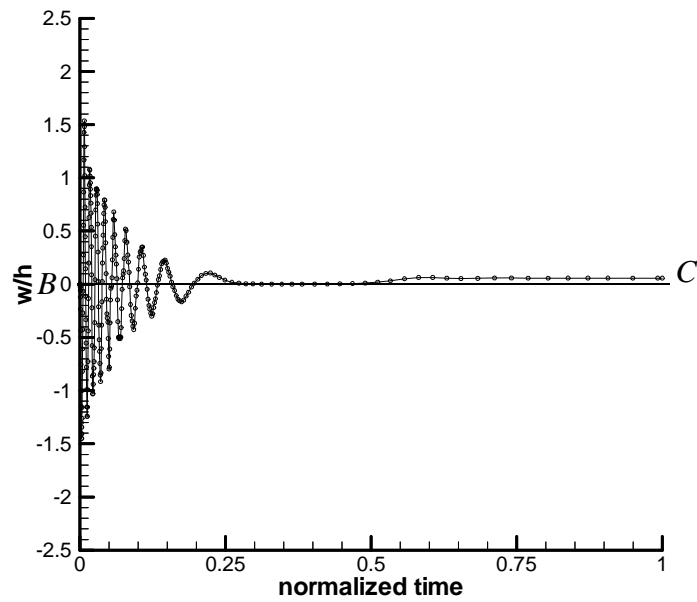


Fig. A.11 1st transient response at III of an aluminum plate (CL-SS)

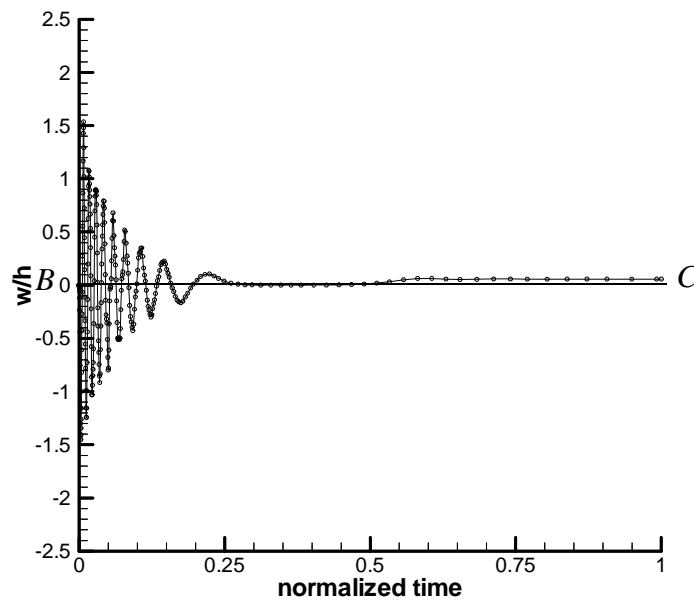


Fig. A.12 1st transient response at I of an aluminum plate (CL-SS)

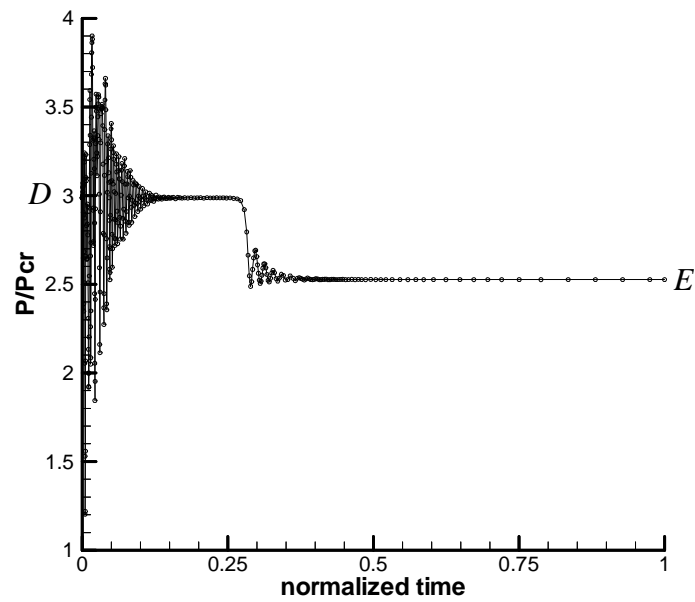


Fig. A.13 2nd transient load response of an aluminum plate (CL-SS)

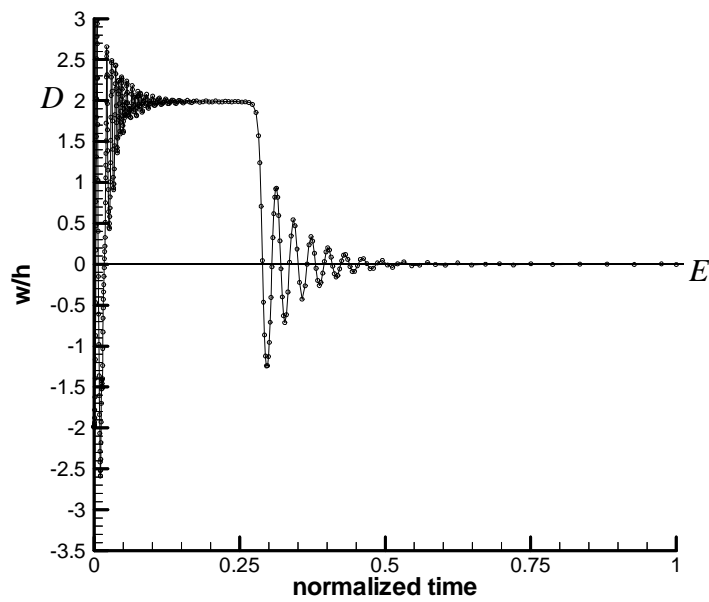


Fig. A.14 2nd transient response at II of an aluminum plate (CL-SS)

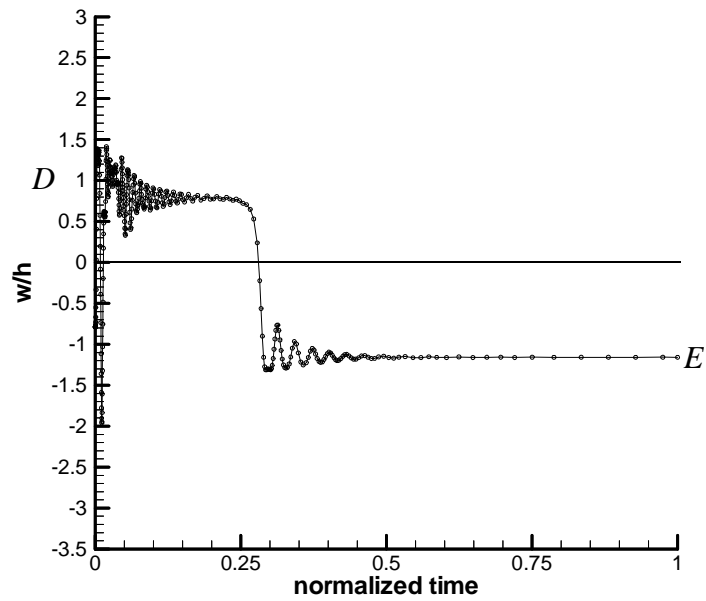


Fig. A.15 2nd transient response at III of an aluminum plate (CL-SS)

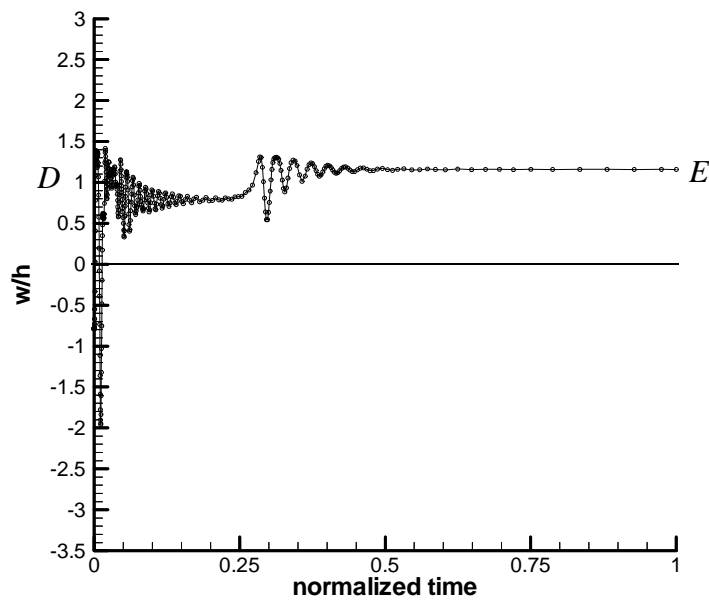


Fig. A.16 2nd transient response at I of an aluminum plate (CL-SS)

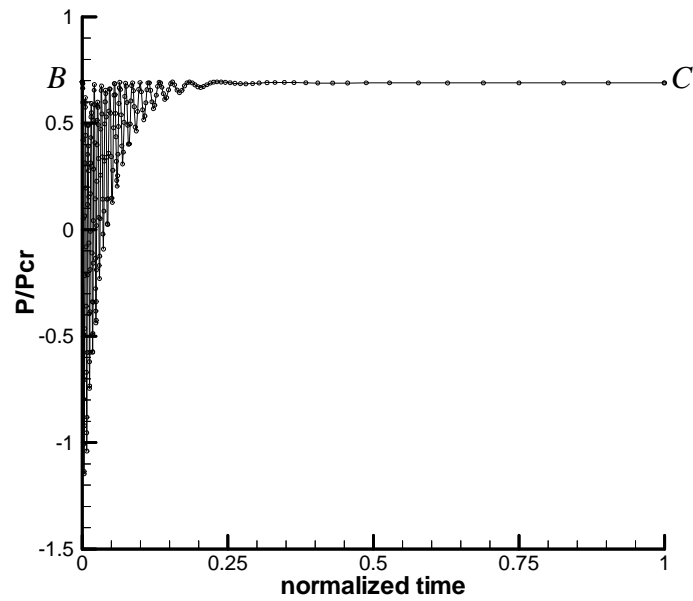


Fig. A.17 1st transient load response of an aluminum plate (SS-SS)

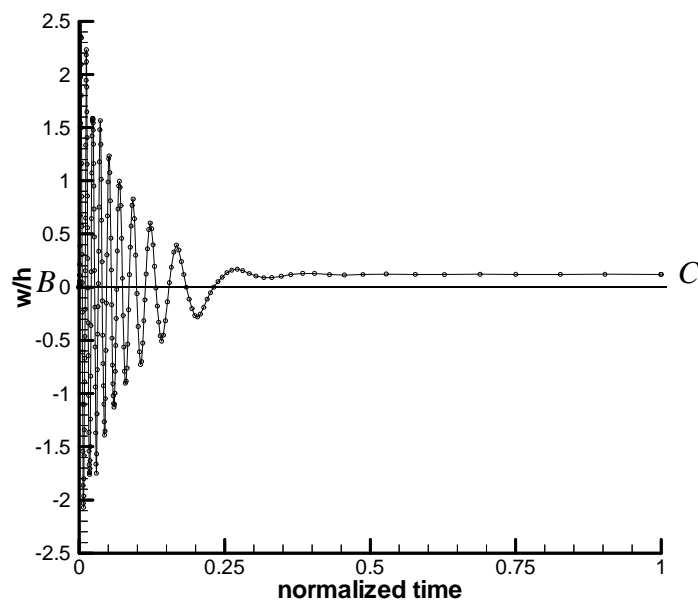


Fig. A.18 1st transient response at II of an aluminum plate (SS-SS)

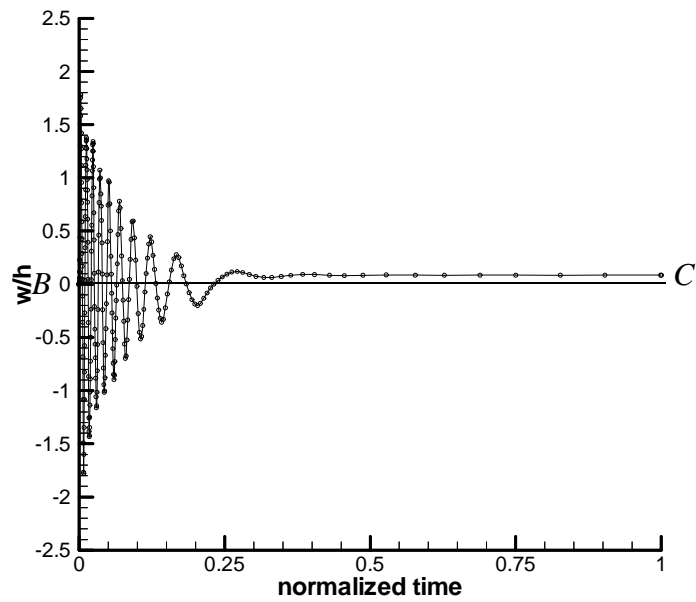


Fig. A.19 1st transient response at III of an aluminum plate (SS-SS)

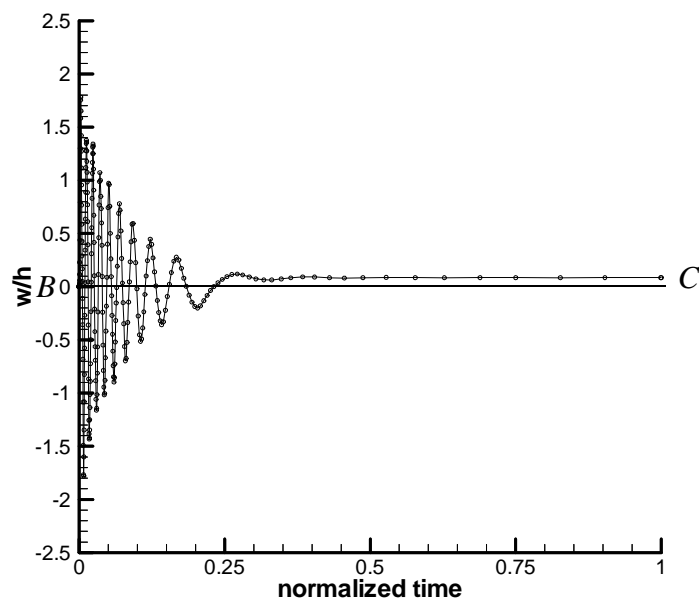


Fig. A.20 1st transient response at I of an aluminum plate (SS-SS)

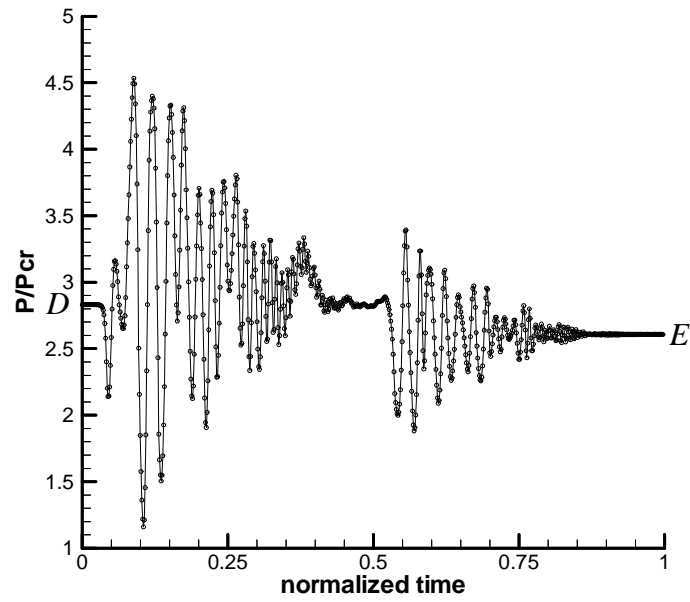


Fig. A.21 2nd transient load response of an aluminum plate (SS-SS)

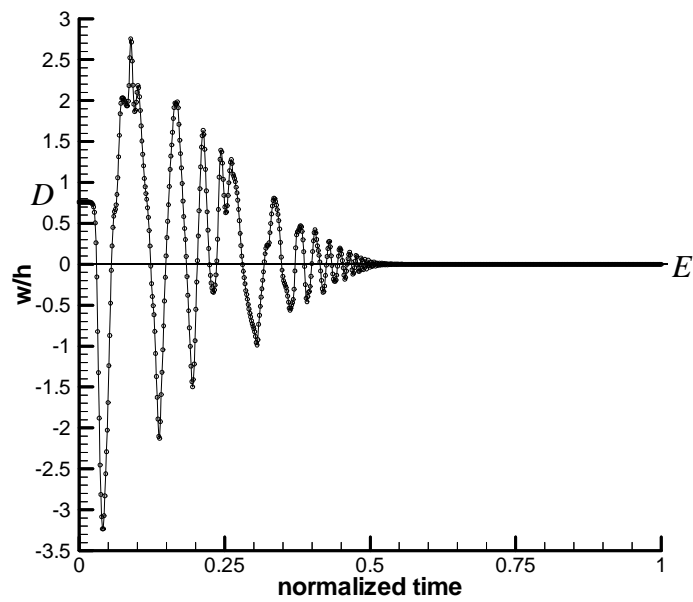


Fig. A.22 2nd transient response at II of an aluminum plate (SS-SS)



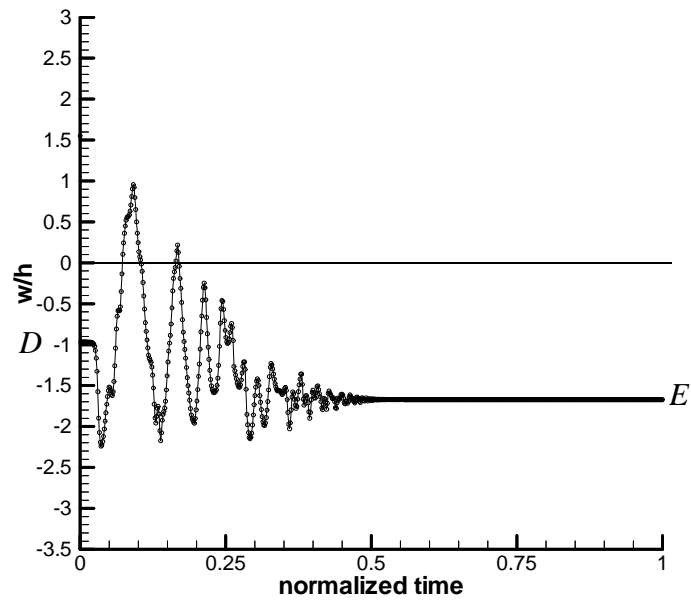


Fig. A.23 2nd transient response at III of an aluminum plate (SS-SS)

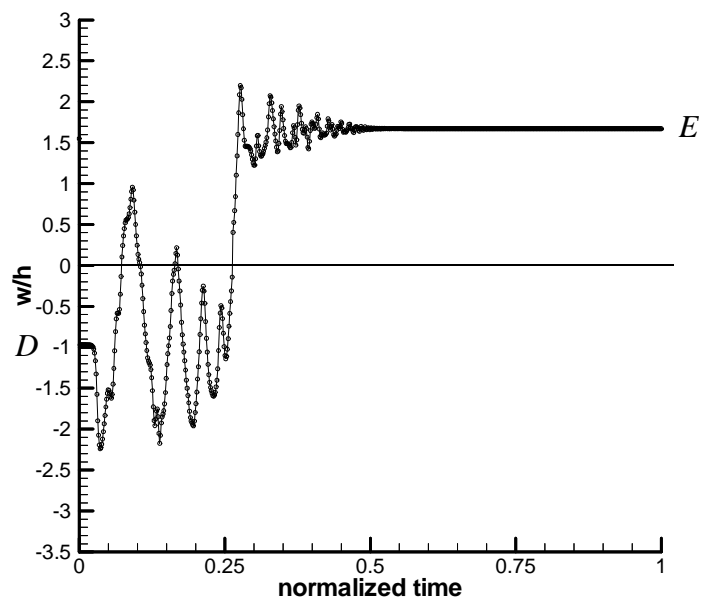


Fig. A.24 2nd transient response at I of an aluminum plate (SS-SS)

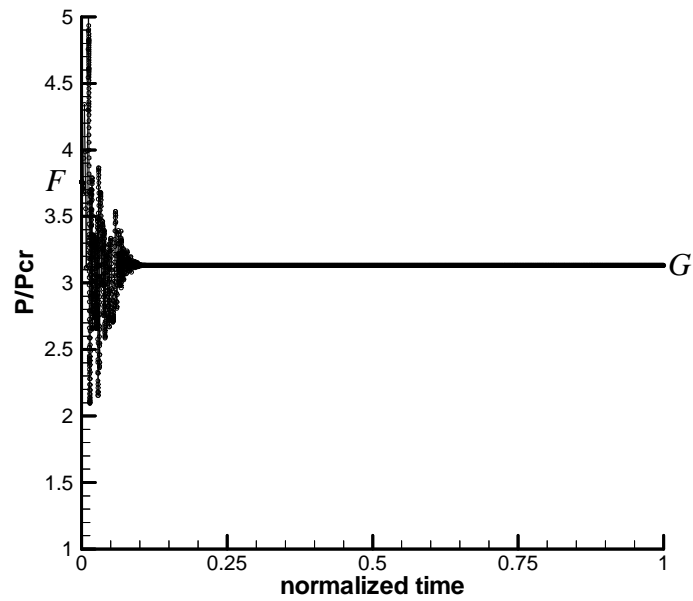


Fig. A.25 3rd transient load response of an aluminum plate (SS-SS)

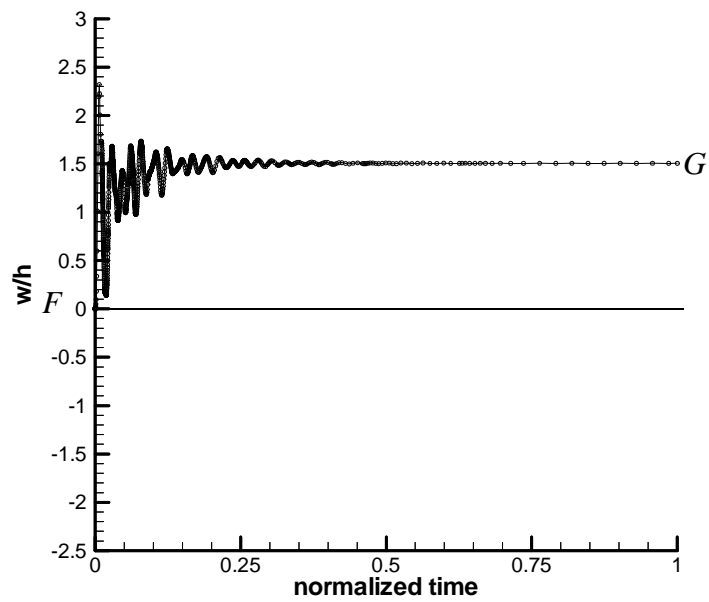


Fig. A.26 3rd transient response at II of an aluminum plate (SS-SS)

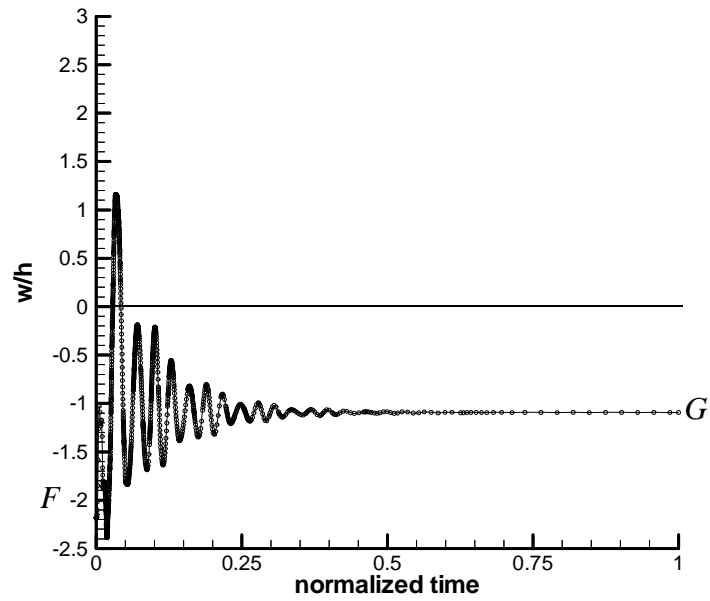


Fig. A.27 3rd transient response at III of an aluminum plate (SS-SS)

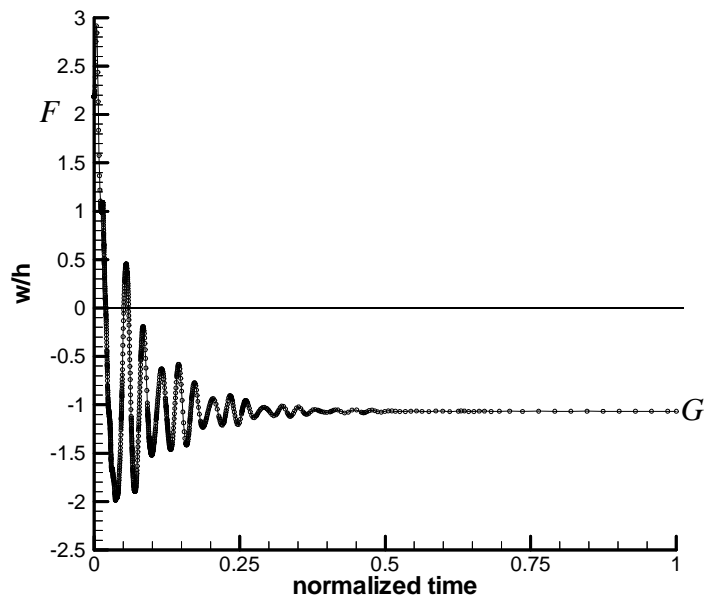


Fig. A.28 3rd transient response at I of an aluminum plate (SS-SS)

## Appendix B: Response of the Refined Mesh Models

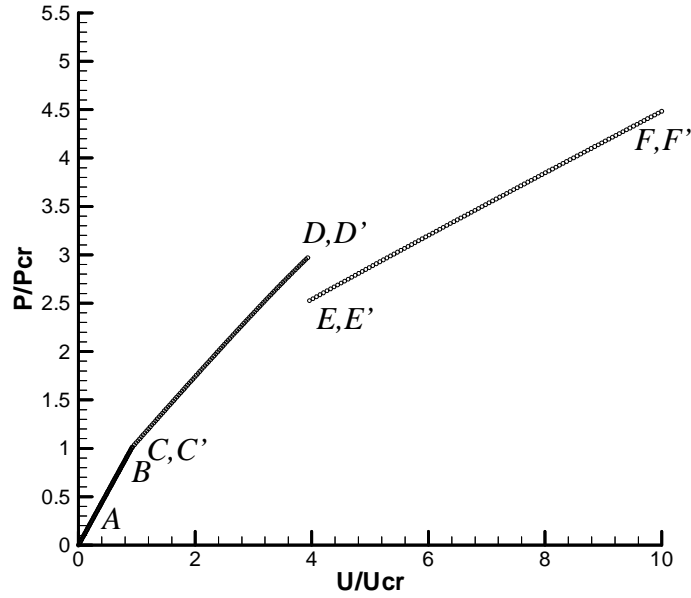


Fig. B.1 Load response of a refined mesh aluminum plate (CL-SS)

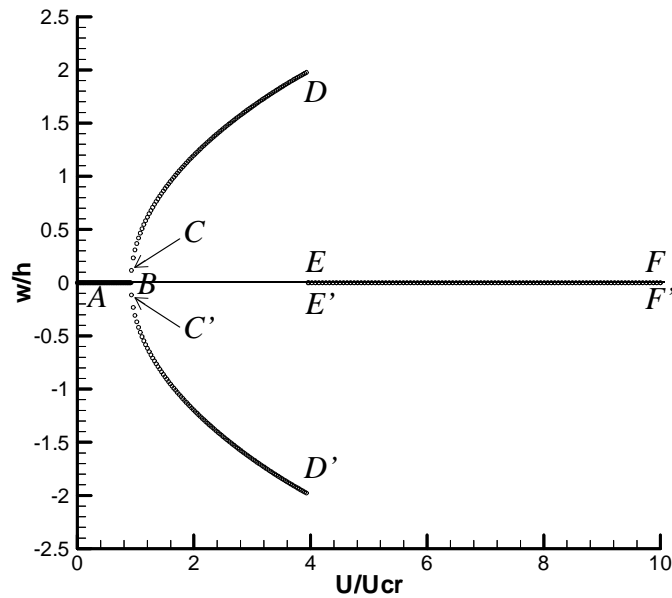


Fig. B.2 Displacement response at II of a refined mesh aluminum plate (CL-SS)

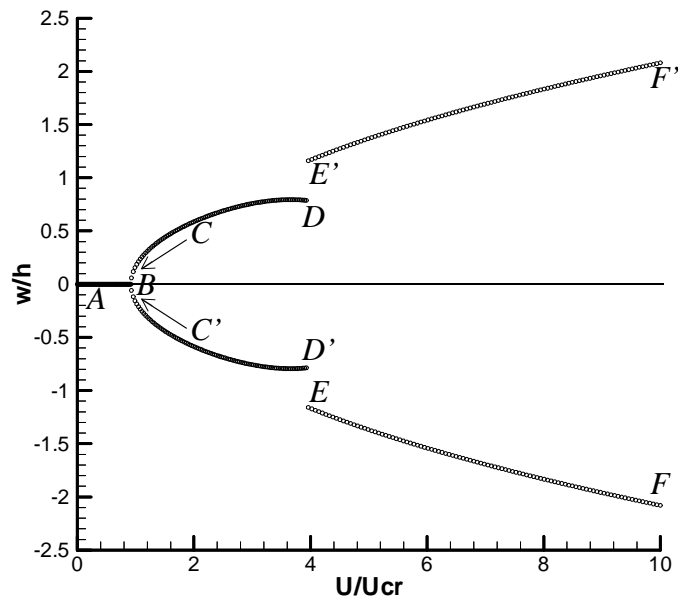


Fig. B.3 Displacement response at III of a refined mesh aluminum plate (CL-SS)

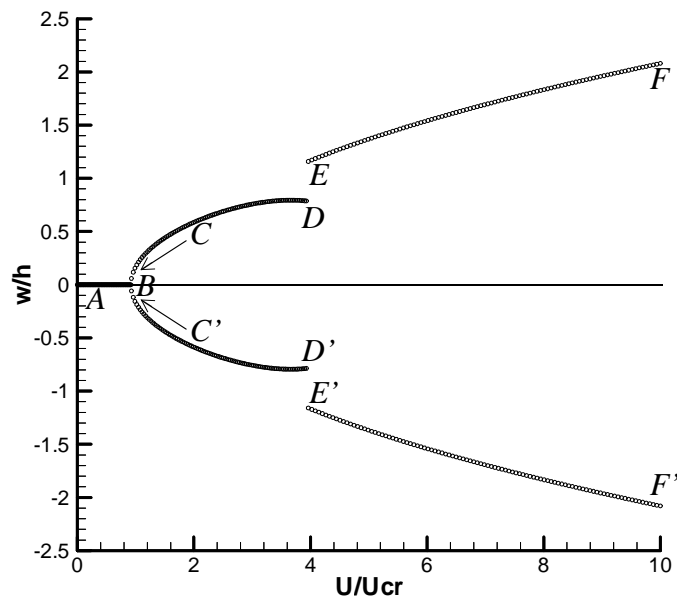


Fig. B.4 Displacement response at I of a refined mesh aluminum plate (CL-SS)

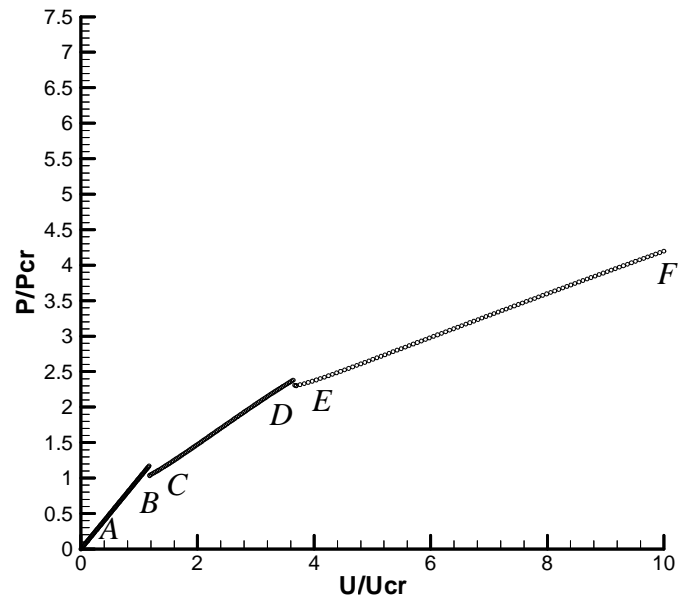


Fig. B.5 Load response of a refined mesh  $[0_4/90_4]_T$  laminate (CL-SS)

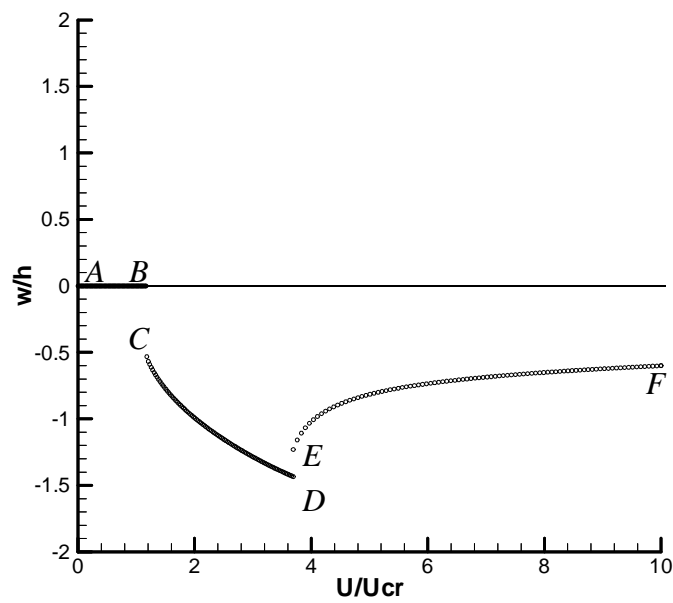


Fig. B.6 Displacement response at II of a refined mesh  $[0_4/90_4]_T$  laminate (CL-SS)

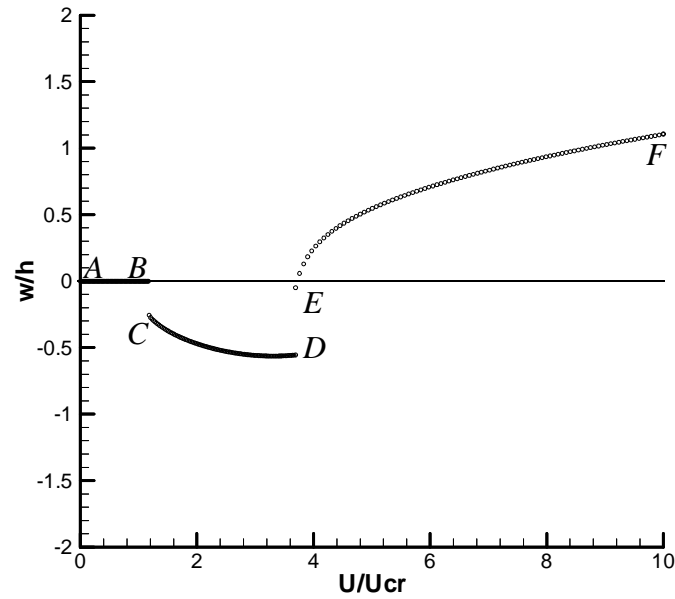


Fig. B.7 Displacement response at III of a refined mesh  $[0_4/90_4]_T$  laminate (CL-SS)

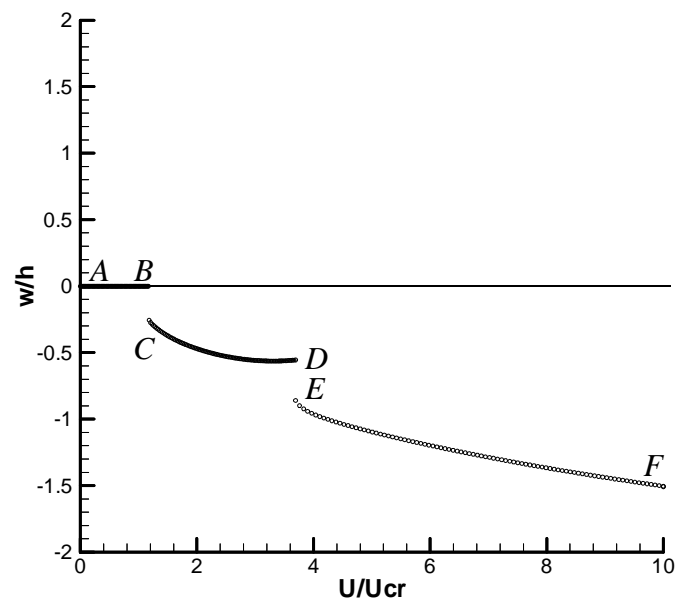


Fig. B.8 Displacement response at I of a refined mesh  $[0_4/90_4]_T$  laminate (CL-SS)

## Appendix C: Plates with $\nu$ -Displacements Free Along Sides

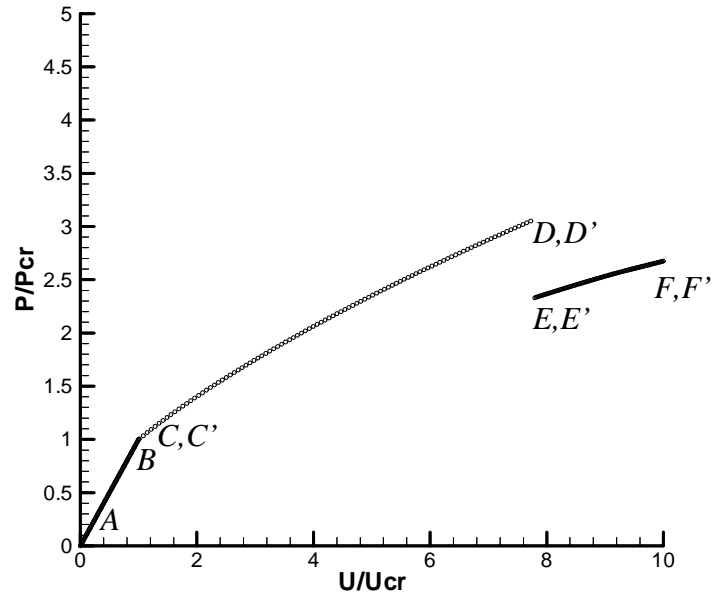


Fig. C.1 Load vs. endshortening relation for aluminum plate (CL-SS)  $\nu$ -free

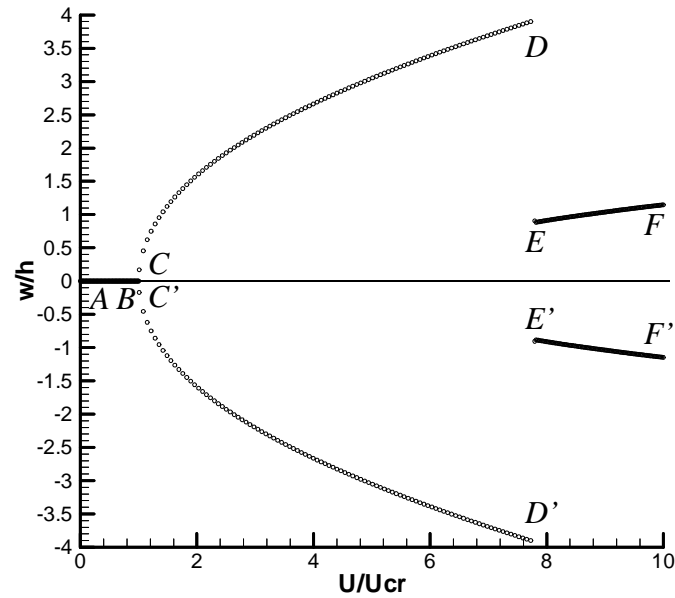


Fig. C.2 Displacement response at II of an aluminum plate (CL-SS)  $\nu$ -free



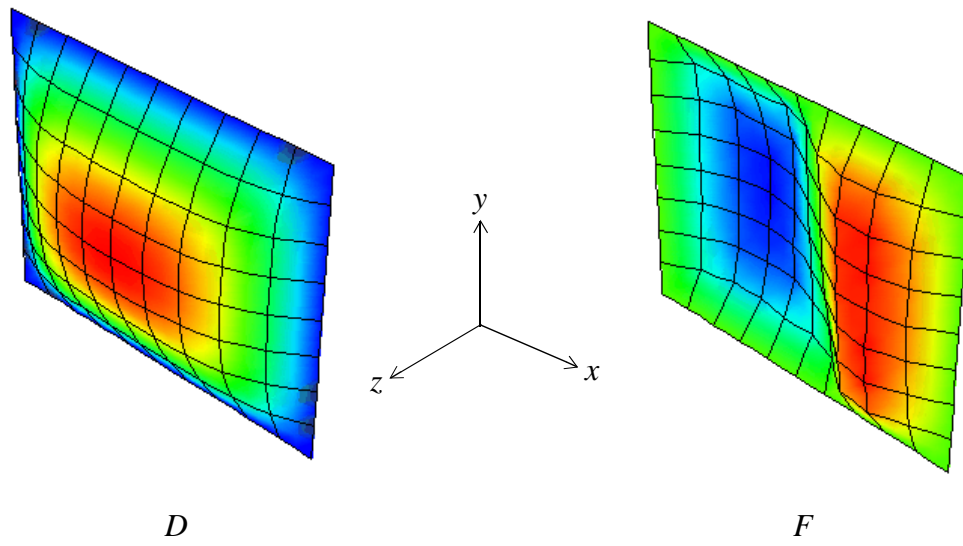


Fig. C.3 Deformed shape at various points, (CL-SS)  $\nu$ -free (see Figs. C.1 and C.2)

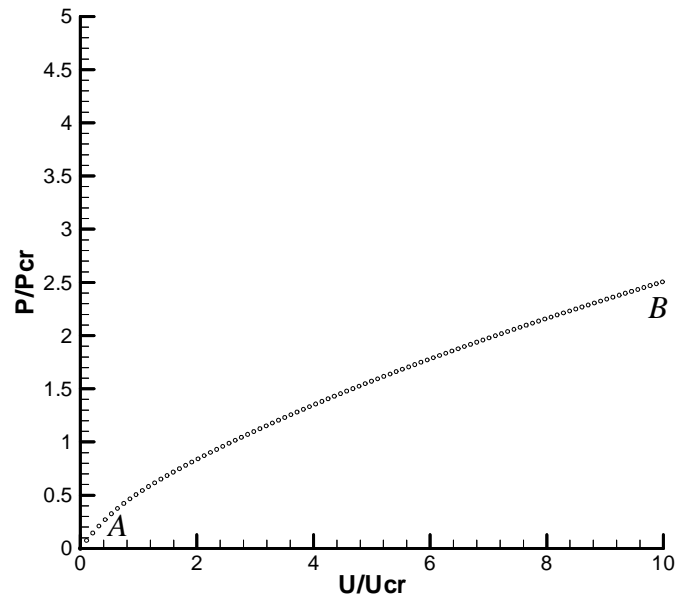


Fig. C.4 Load vs. endshortening relation for  $[0_4/90_4]_T$  laminate (CL-SS)  $\nu$ -free

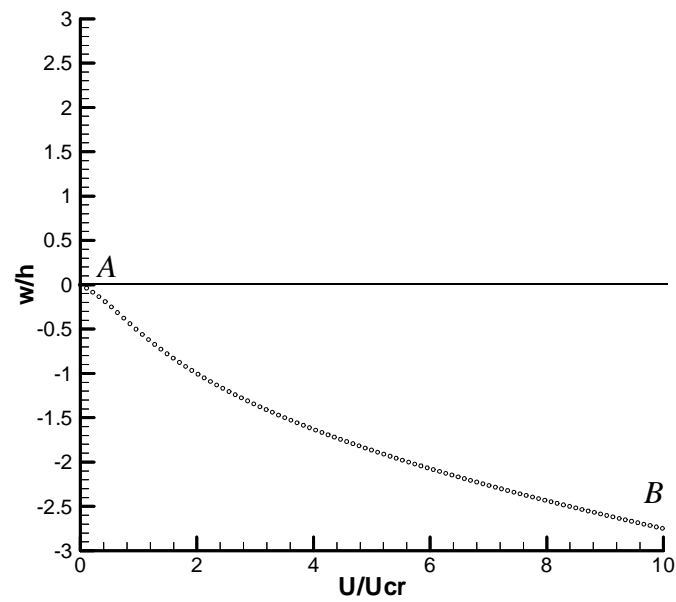


Fig. C.5 Displacement response at II of an  $[0_4/90_4]_T$  laminate (CL-SS)  $\nu$ -free

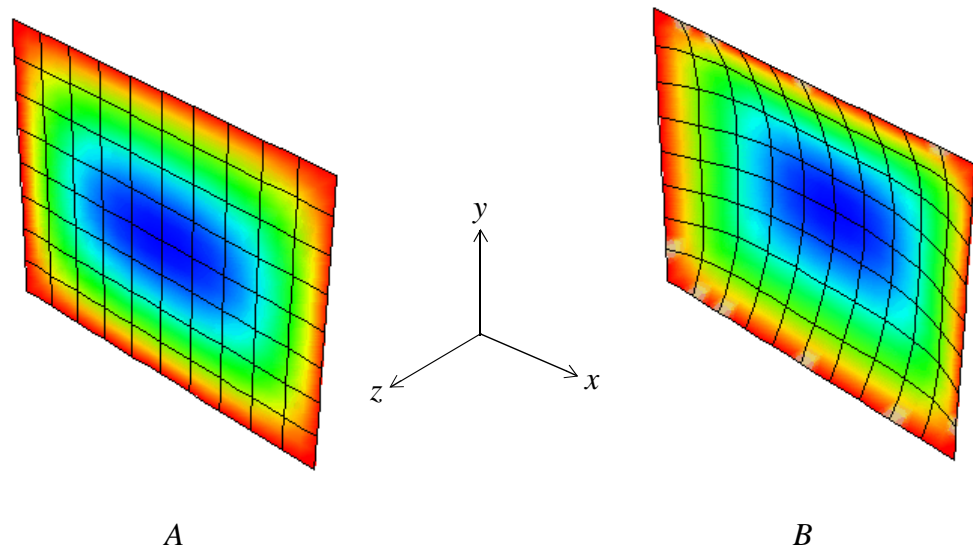


Fig. C.6 Deformed shape at various points, (CL-SS)  $\nu$ -free (see Figs. C.4 and C.5)

## Appendix D: Static Response of an Aluminum Plate (SS-SS)

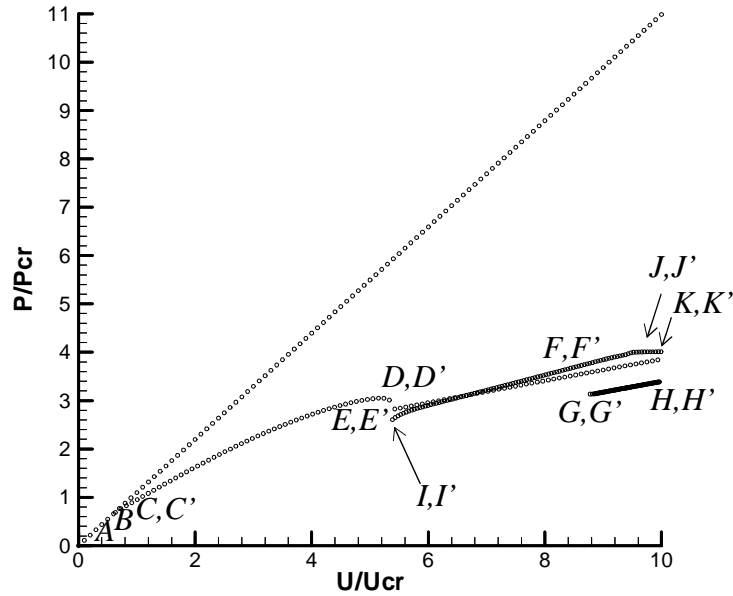


Fig. D.1 Equilibrium load response of an aluminum plate (SS-SS)

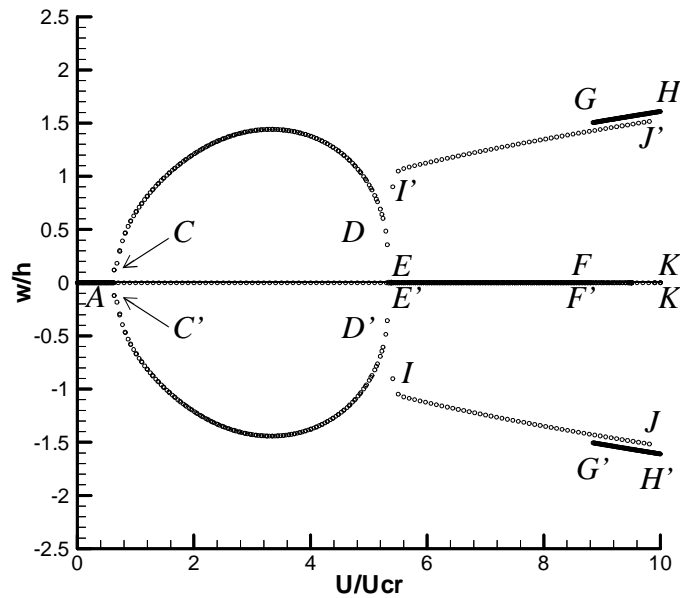


Fig. D.2 Equilibrium displacement response at II of an aluminum plate (SS-SS)

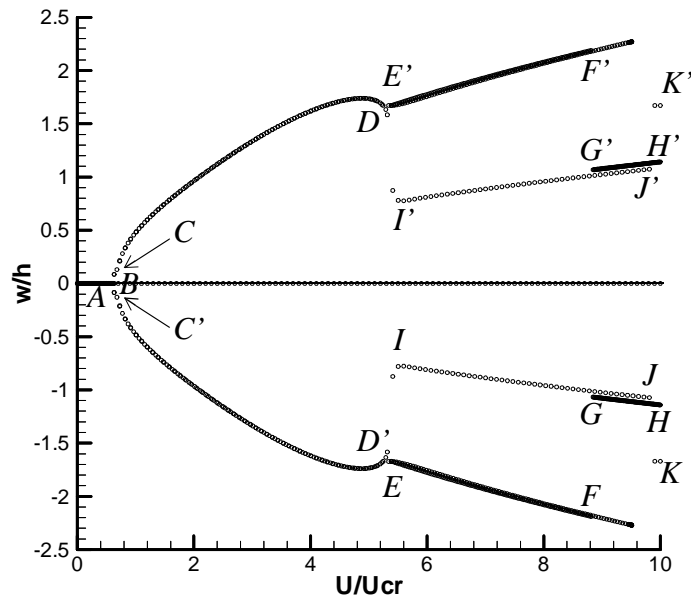


Fig. D.3 Equilibrium displacement response at III of an aluminum plate (SS-SS)

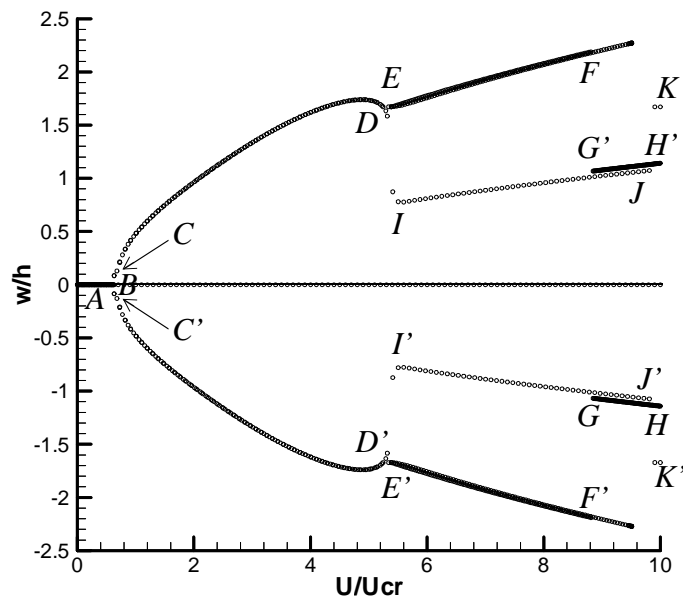


Fig. D.4 Equilibrium displacement response at I of an aluminum plate (SS-SS)

## Appendix E: Dynamic Response of Cross-Ply Laminates

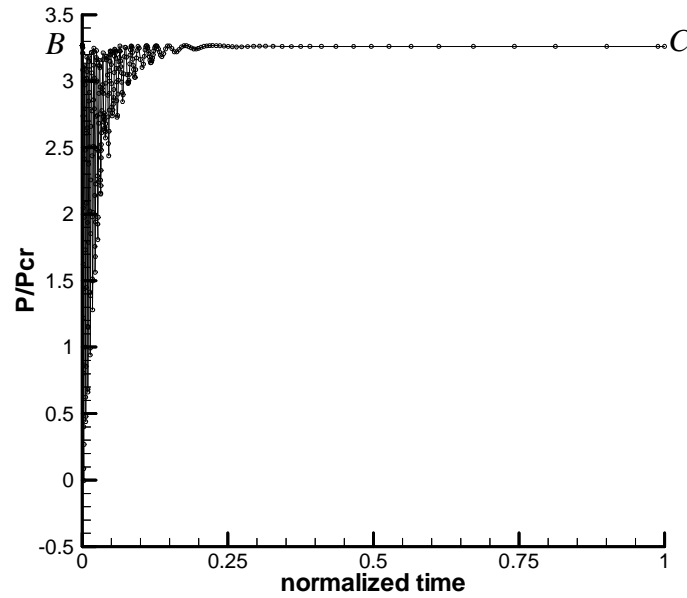


Fig. E.1 1st transient load response of a  $[0_2/90_2]_S$  laminate (CL-CL)

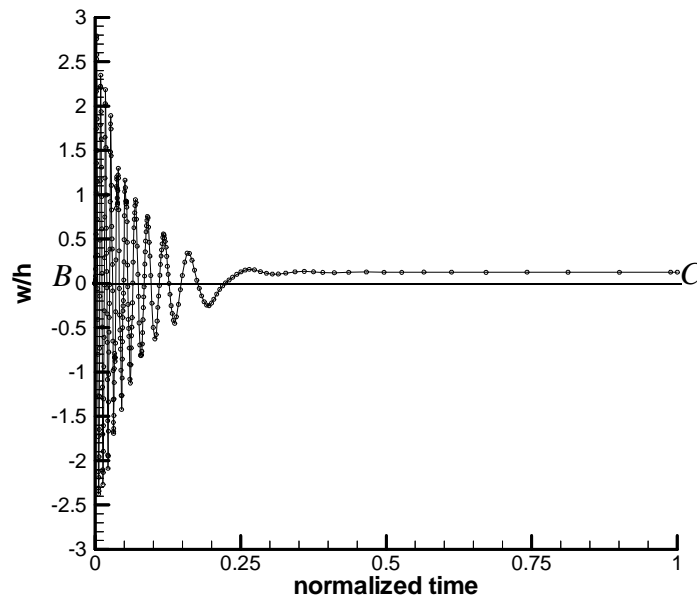
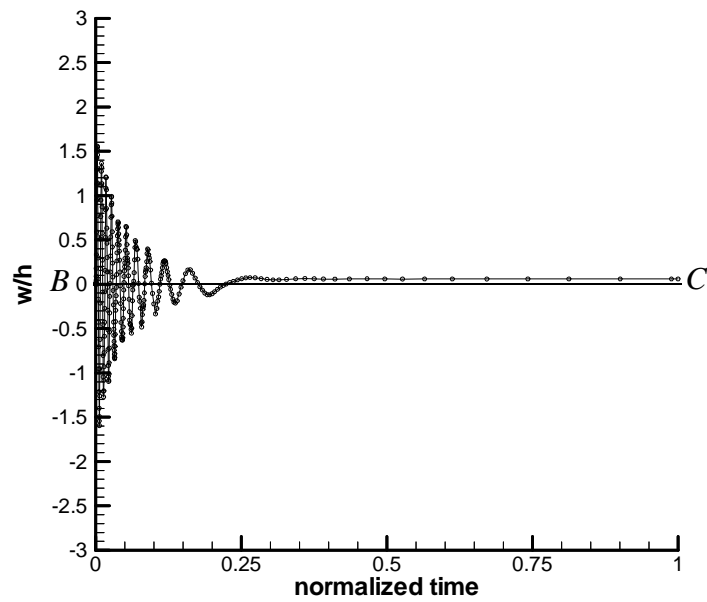
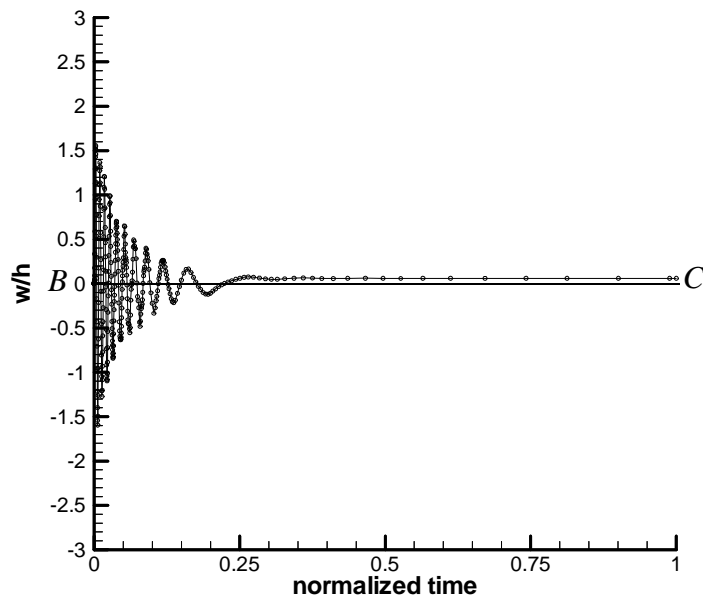


Fig. E.2 1st transient response at II of a  $[0_2/90_2]_S$  laminate (CL-CL)

Fig. E.3 1st transient response at III of a  $[0_2/90_2]_S$  laminate (CL-CL)Fig. E.4 1st transient response at I of a  $[0_2/90_2]_S$  laminate (CL-CL)

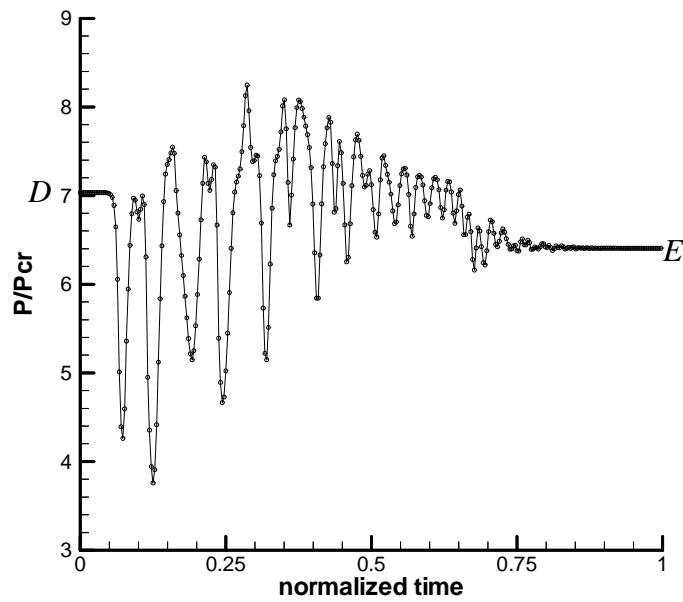


Fig. E.5 2nd transient load response of a  $[0_2/90_2]_S$  laminate (CL-CL)

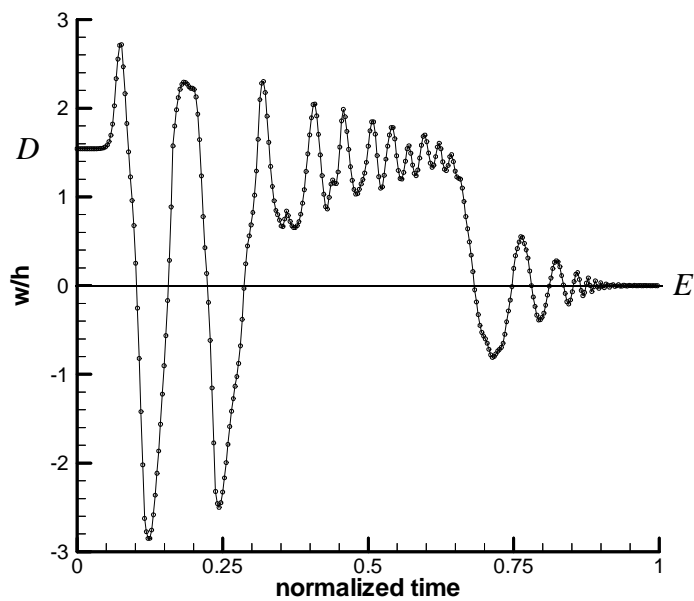


Fig. E.6 2nd transient response at II of a  $[0_2/90_2]_S$  laminate (CL-CL)



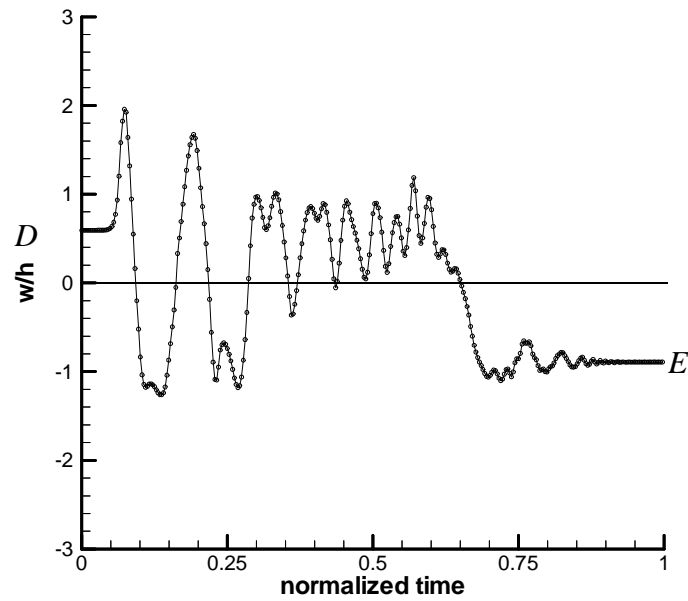


Fig. E.7 2nd transient response at III of a  $[0_2/90_2]_S$  laminate (CL-CL)

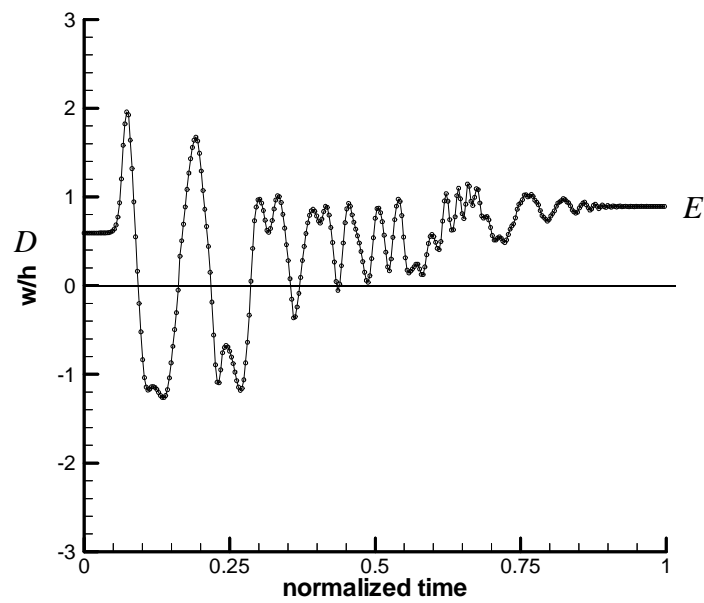
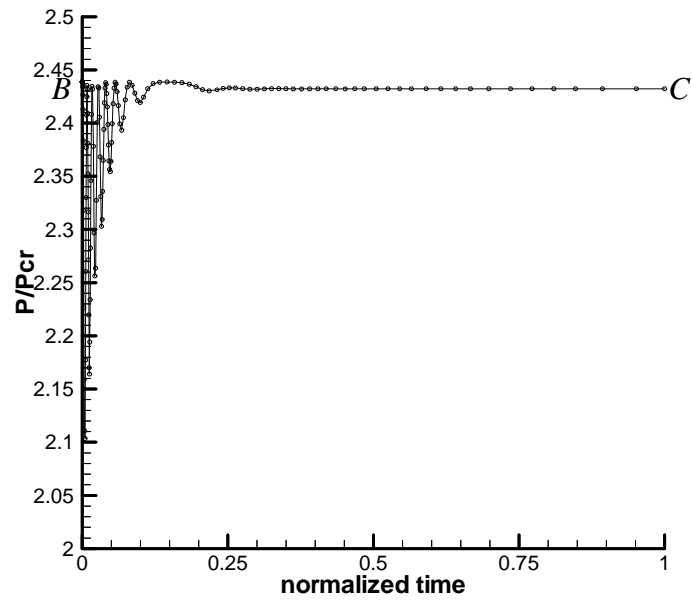
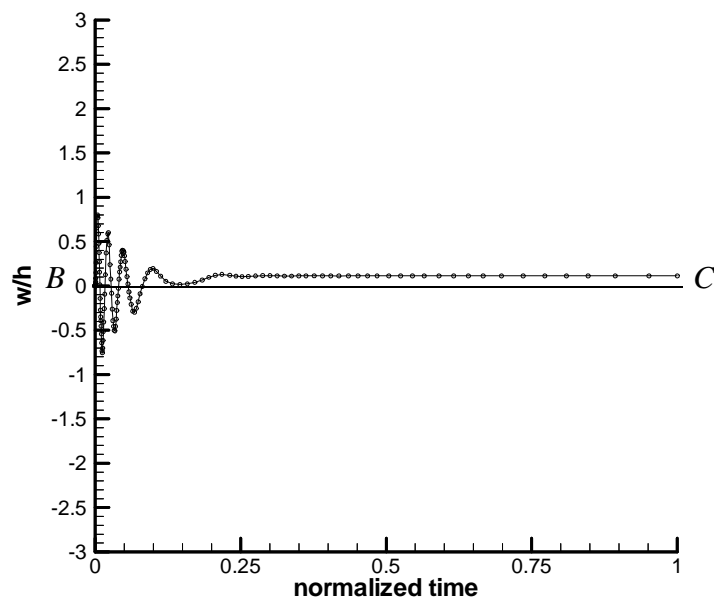
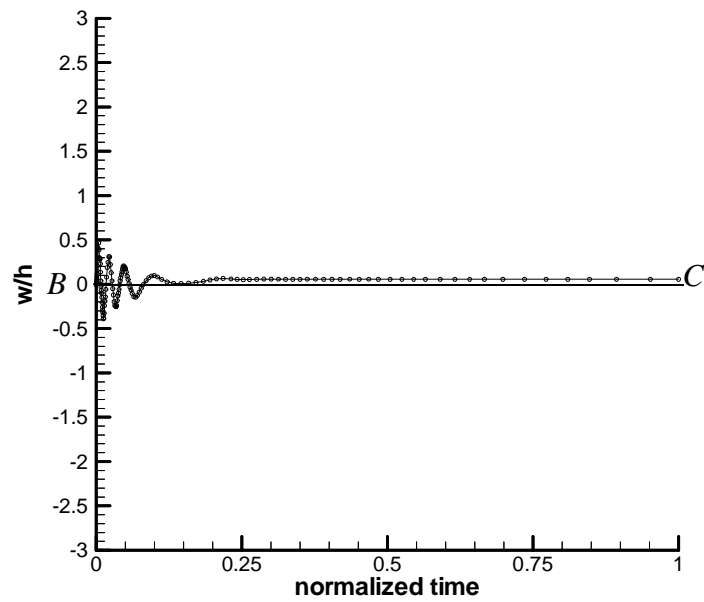
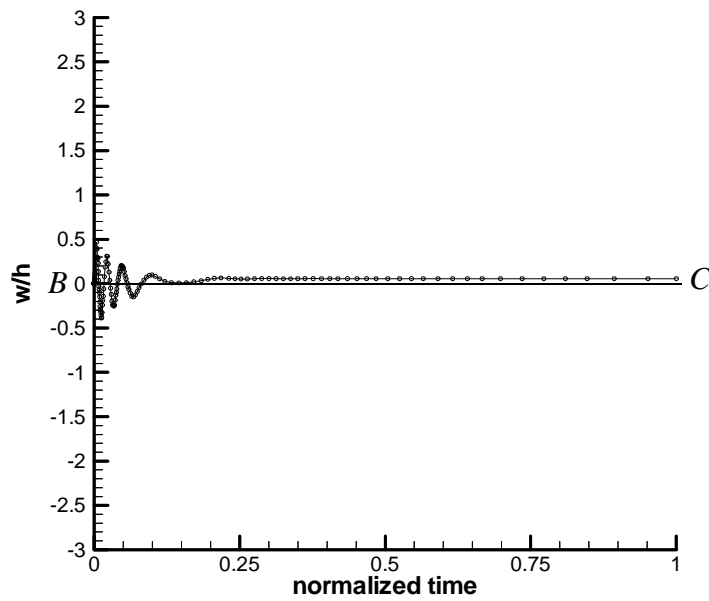
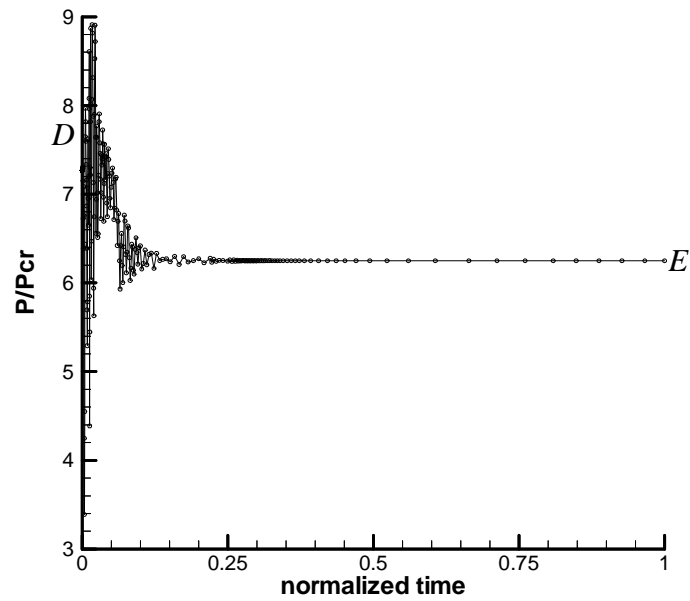
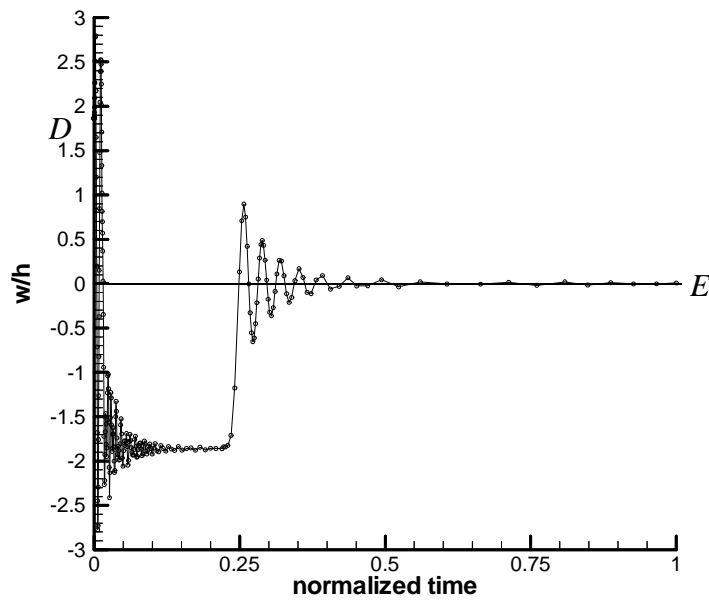


Fig. E.8 2nd transient response at I of a  $[0_2/90_2]_S$  laminate (CL-CL)

Fig. E.9 1st transient load response of a  $[0_2/90_2]_S$  laminate (CL-SS)Fig. E.10 1st transient response at II of a  $[0_2/90_2]_S$  laminate (CL-SS)

Fig. E.11 1st transient response at III of a  $[0_2/90_2]_S$  laminate (CL-SS)Fig. E.12 1st transient response at I of a  $[0_2/90_2]_S$  laminate (CL-SS)

Fig. E.13 2nd transient load response of a  $[0_2/90_2]_S$  laminate (CL-SS)Fig. E.14 2nd transient response at II of a  $[0_2/90_2]_S$  laminate (CL-SS)

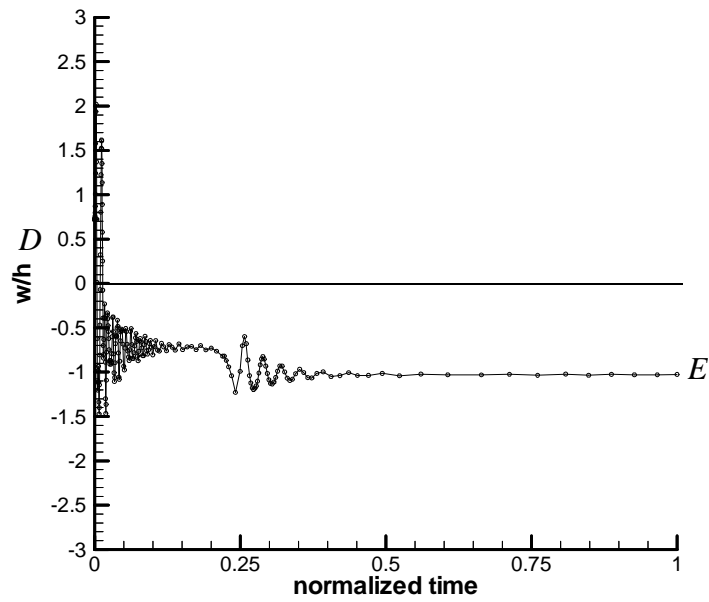


Fig. E.15 2nd transient response at III of a  $[0_2/90_2]_S$  laminate (CL-SS)

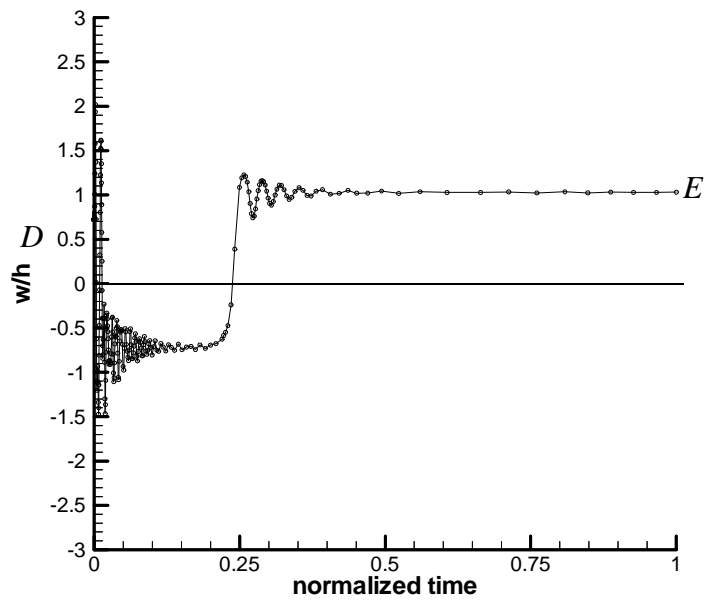
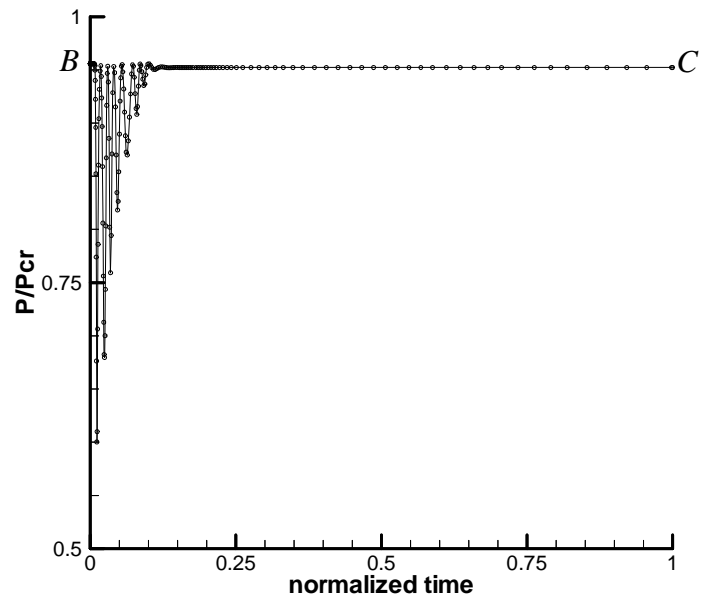
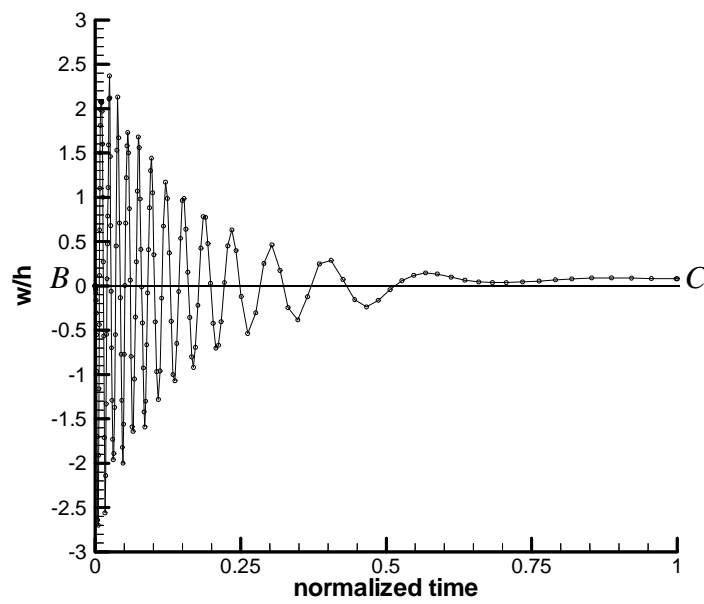
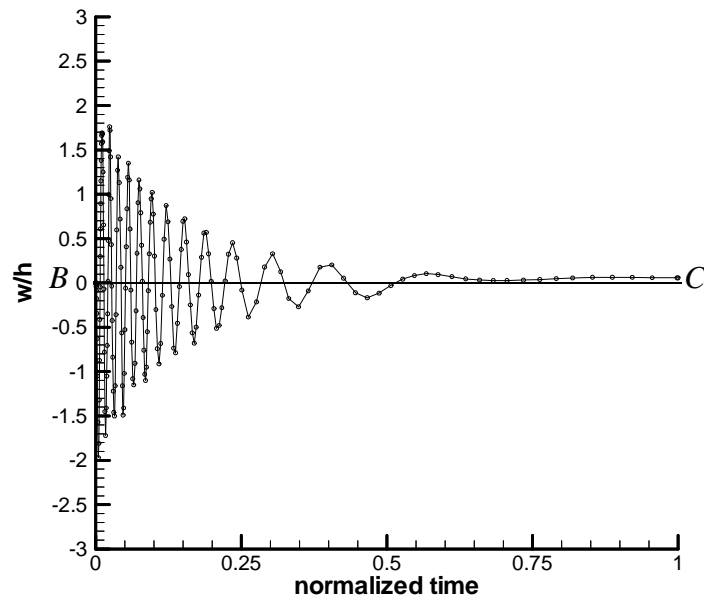
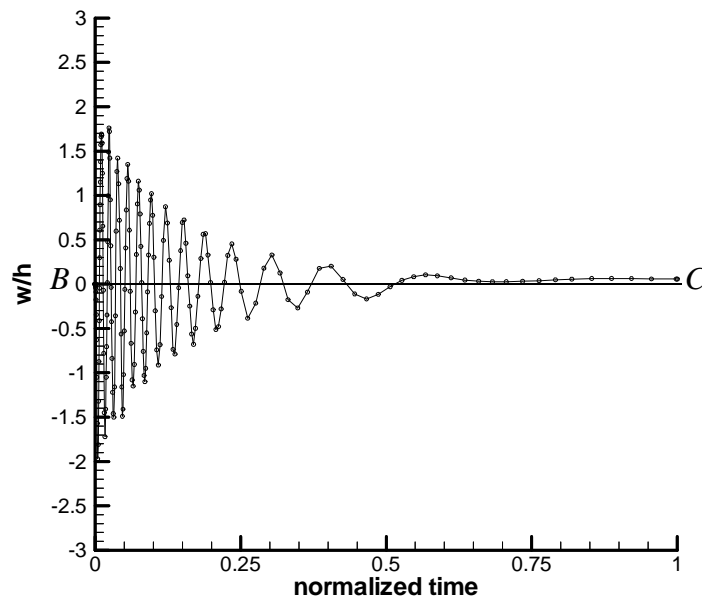
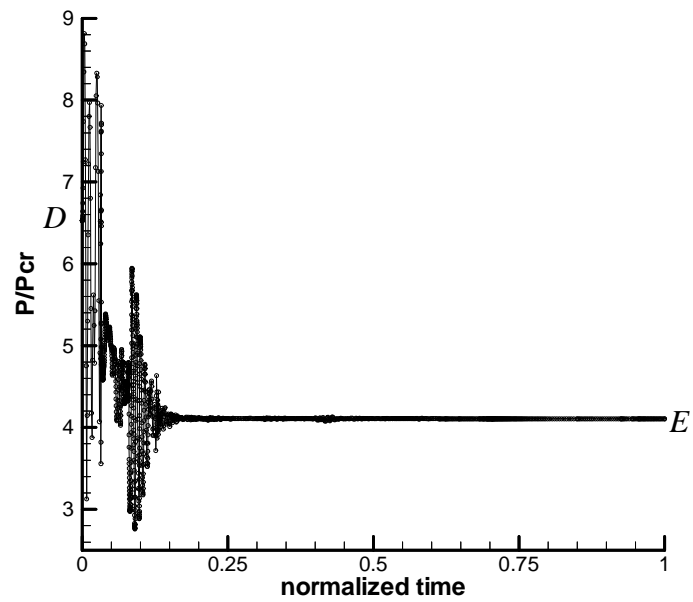
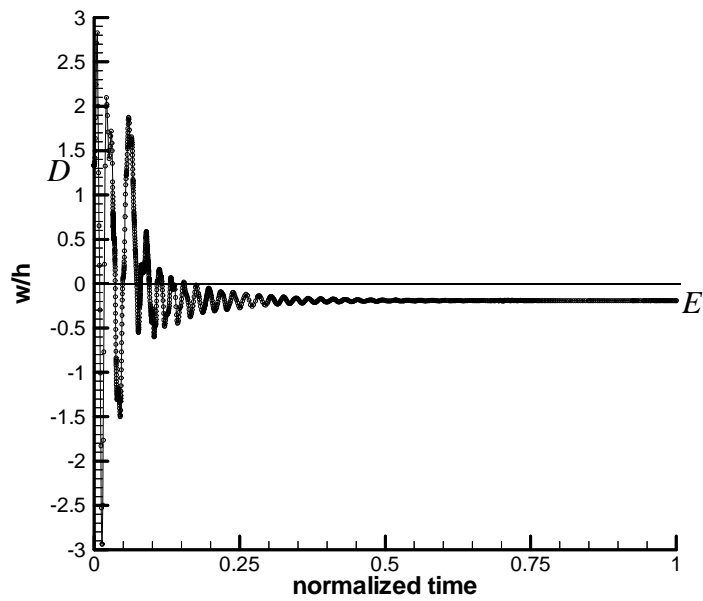


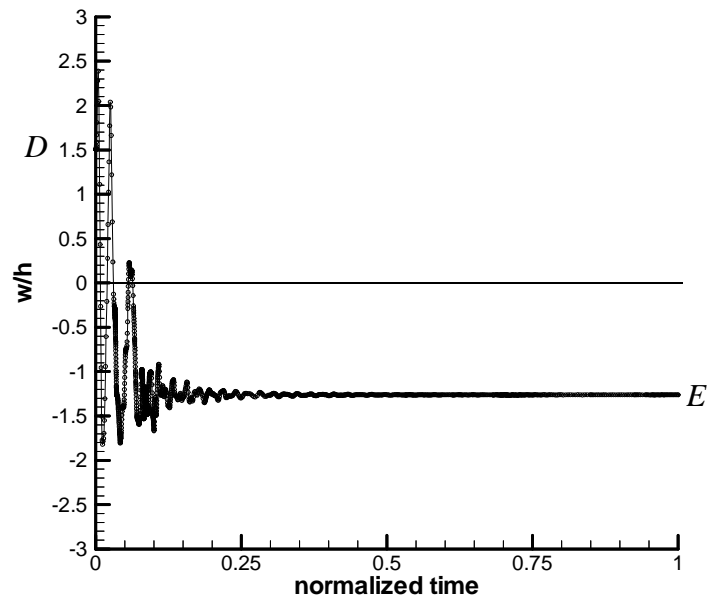
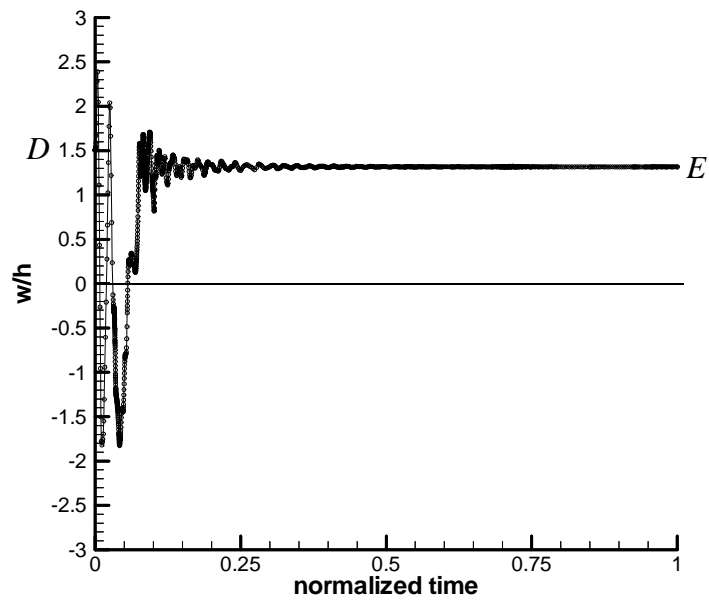
Fig. E.16 2nd transient response at I of a  $[0_2/90_2]_S$  laminate (CL-SS)

Fig. E.17 1st transient load response of a  $[0_2/90_2]_S$  laminate (SS-SS)Fig. E.18 1st transient response at II of a  $[0_2/90_2]_S$  laminate (SS-SS)

Fig. E.19 1st transient response at III of a  $[0_2/90_2]_S$  laminate (SS-SS)Fig. E.20 1st transient response at I of a  $[0_2/90_2]_S$  laminate (SS-SS)

Fig. E.21 2nd transient load response of a  $[0_2/90_2]_S$  laminate (SS-SS)Fig. E.22 2nd transient response at II of a  $[0_2/90_2]_S$  laminate (SS-SS)



Fig. E.23 2nd transient response at III of a  $[0_2/90_2]_S$  laminate (SS-SS)Fig. E.24 2nd transient response at I of a  $[0_2/90_2]_S$  laminate (SS-SS)

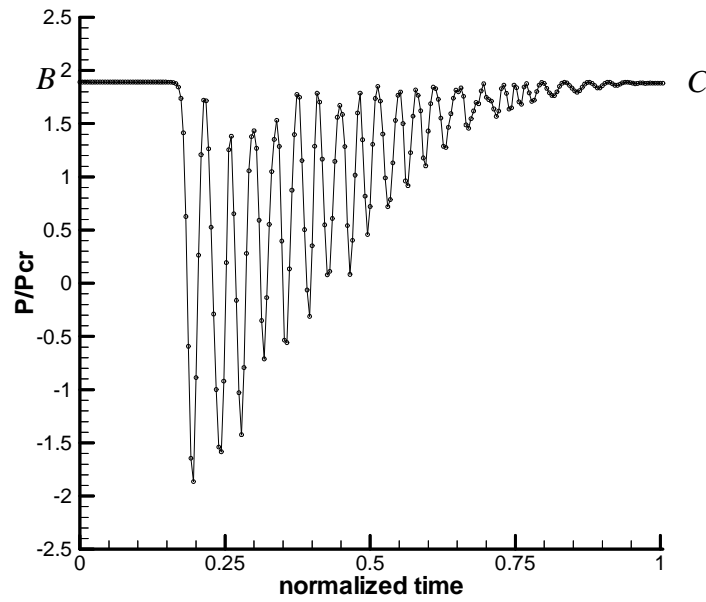


Fig. E.25 1st transient load response of a 16 in. by 16 in.  $[0_4/90_4]_T$  laminate (CL-CL)

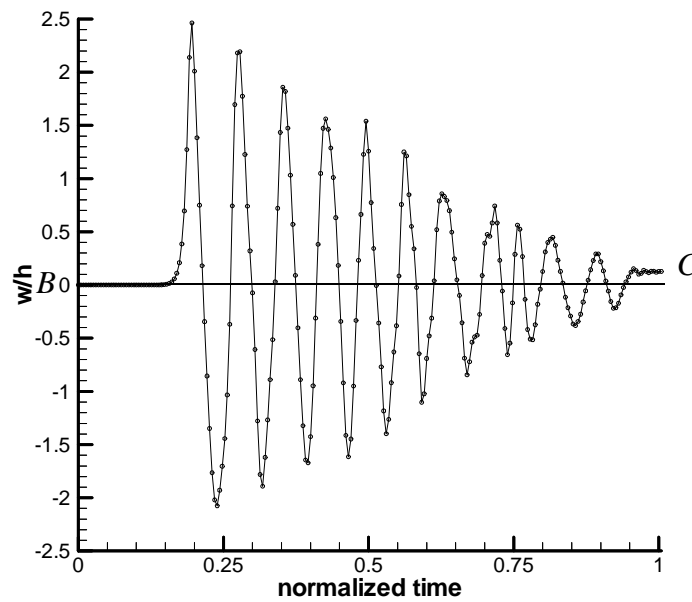


Fig. E.26 1st transient response at II of a 16 in. by 16 in.  $[0_4/90_4]_T$  laminate (CL-CL)

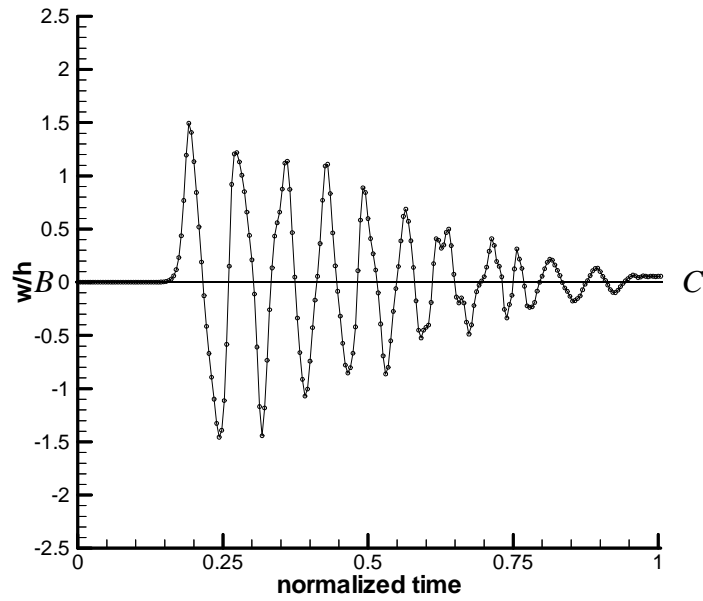


Fig. E.27 1st transient response at III of a 16 in. by 16 in.  $[0_4/90_4]_T$  laminate (CL-CL)

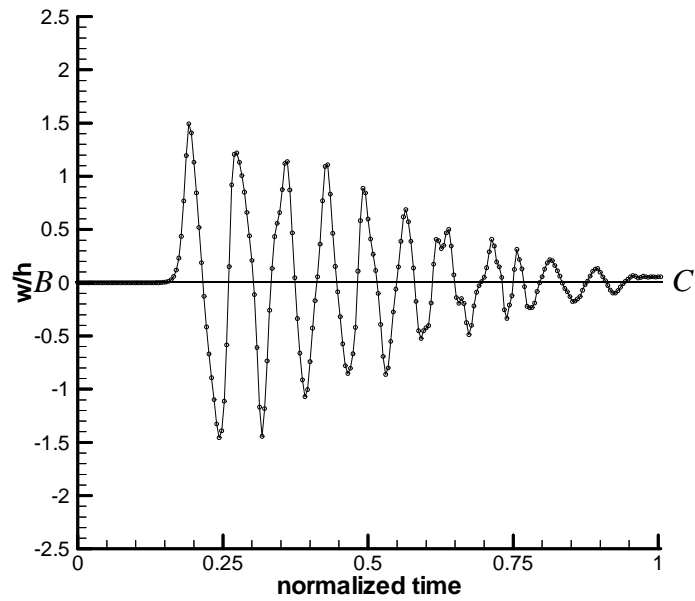


Fig. E.28 1st transient response at I of a 16 in. by 16 in.  $[0_4/90_4]_T$  laminate (CL-CL)

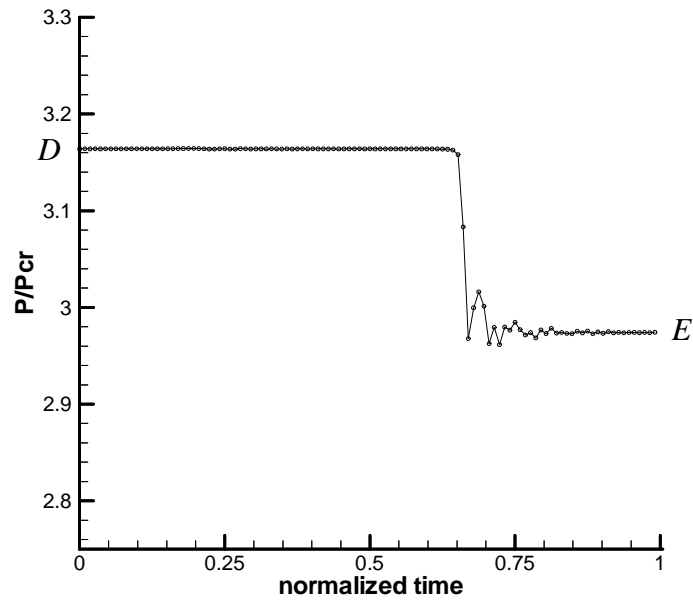


Fig. E.29 2nd transient load response of a 16 in. by 16 in.  $[0_4/90_4]_T$  laminate (CL-CL)

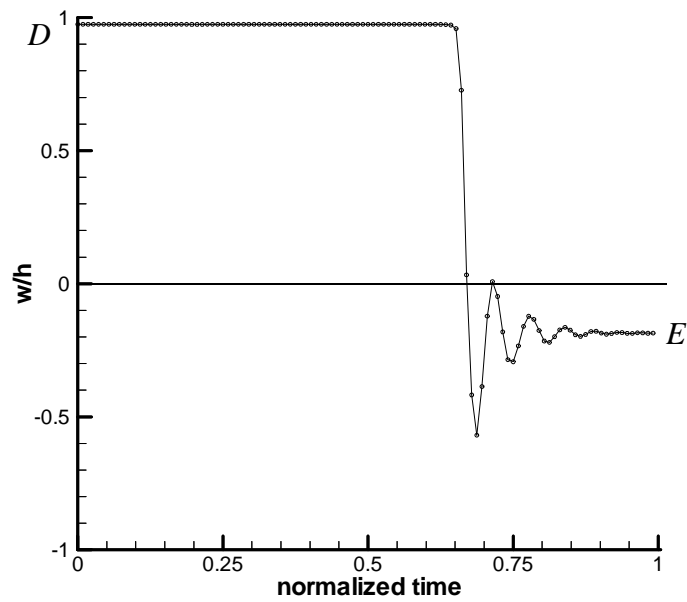


Fig. E.30 2nd transient response at II of a 16 in. by 16 in.  $[0_4/90_4]_T$  laminate (CL-CL)

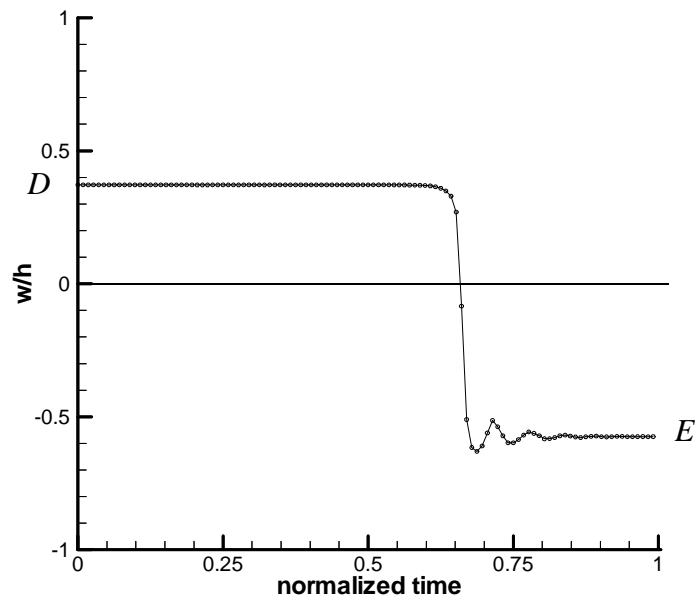


Fig. E.31 2nd transient response at III of a 16 in. by 16 in.  $[0_4/90_4]_T$  laminate (CL-CL)

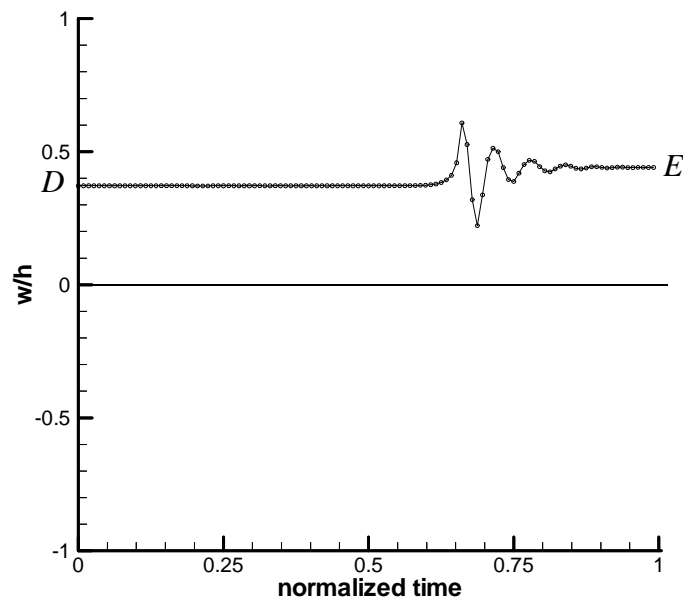


Fig. E.32 2nd transient response at I of a 16 in. by 16 in.  $[0_4/90_4]_T$  laminate (CL-CL)

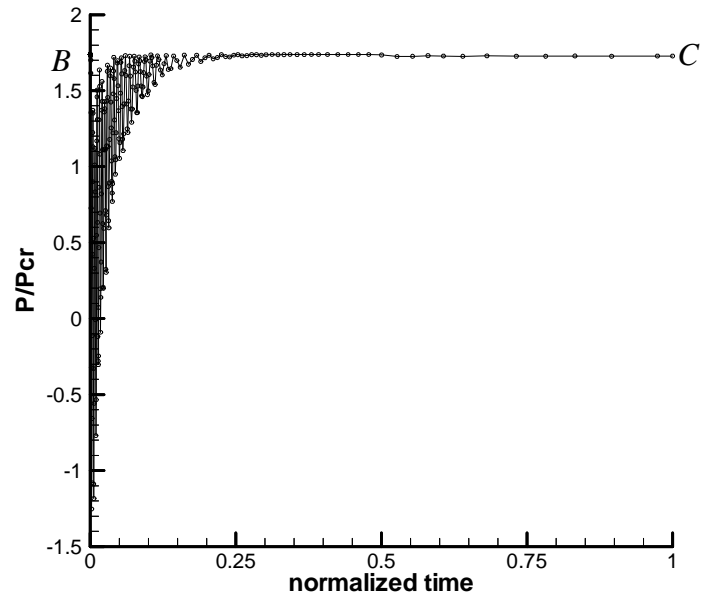


Fig. E.33 Transient load response of a  $[0_4/90_4]_T$  laminate (CL-CL)

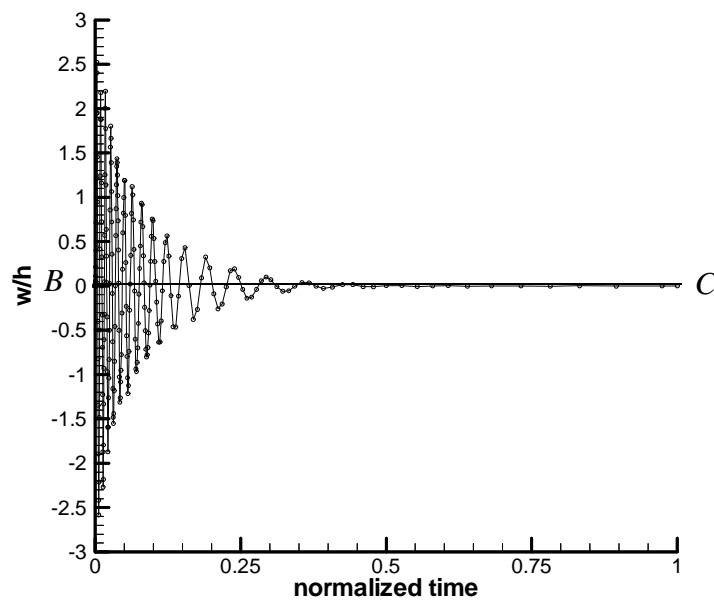
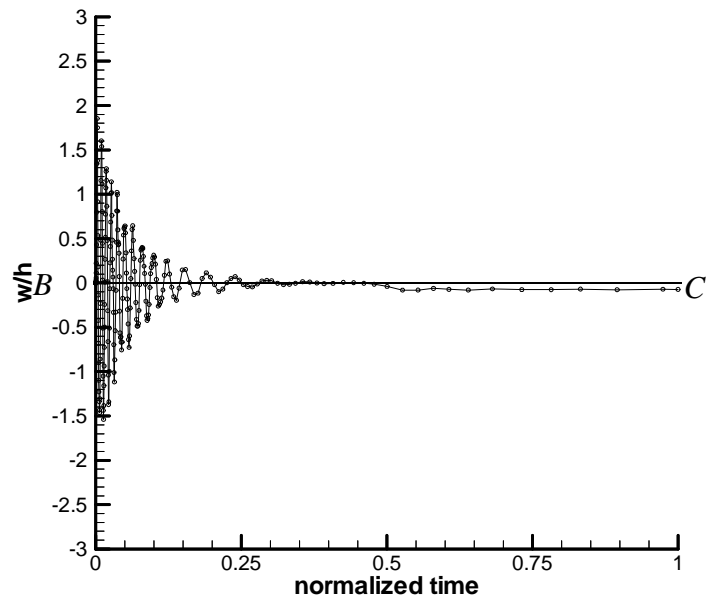
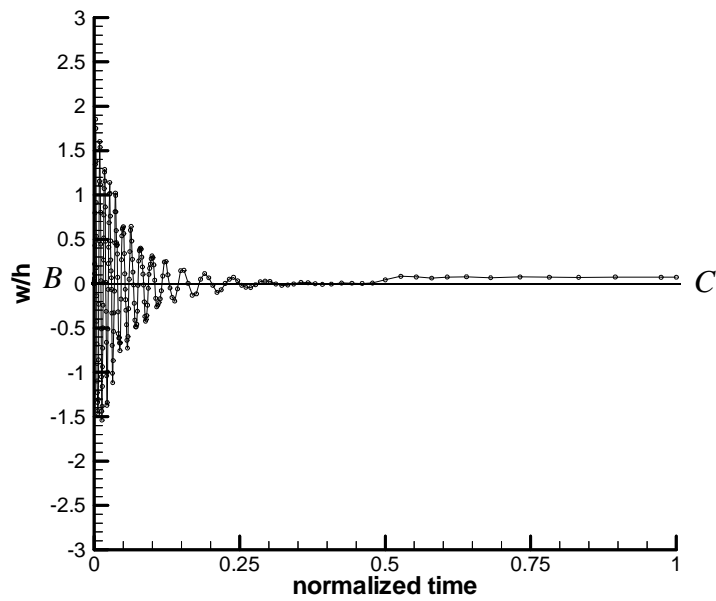
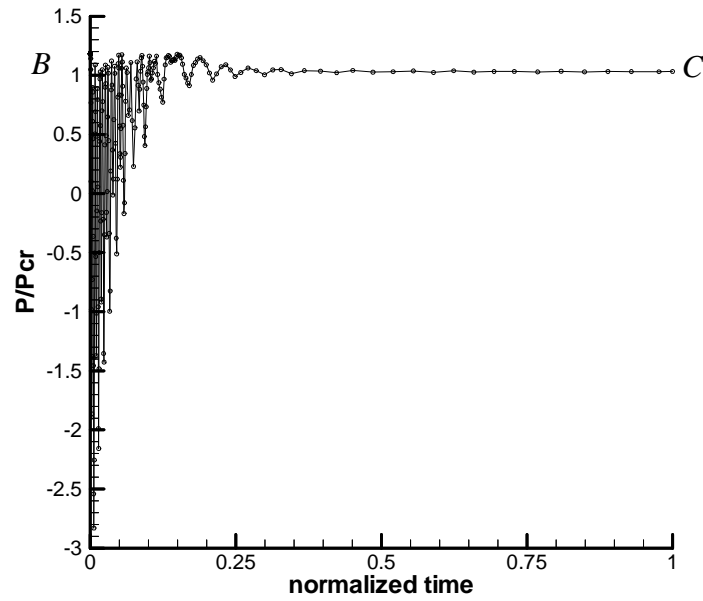
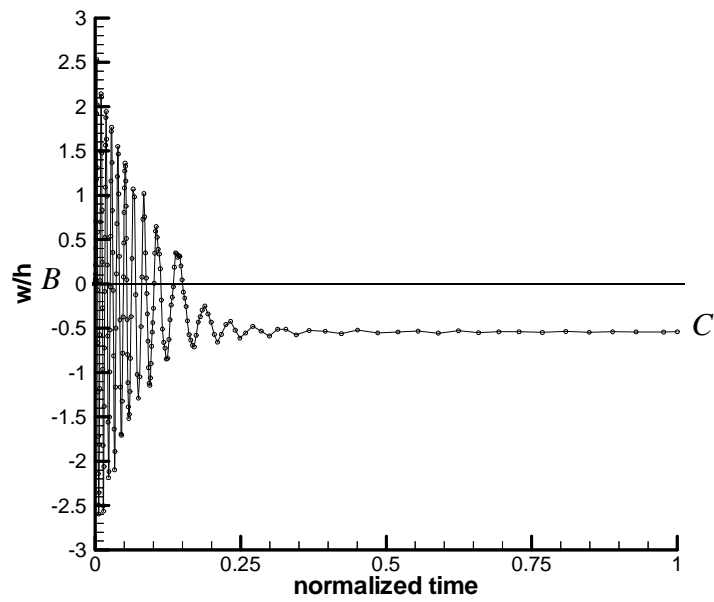
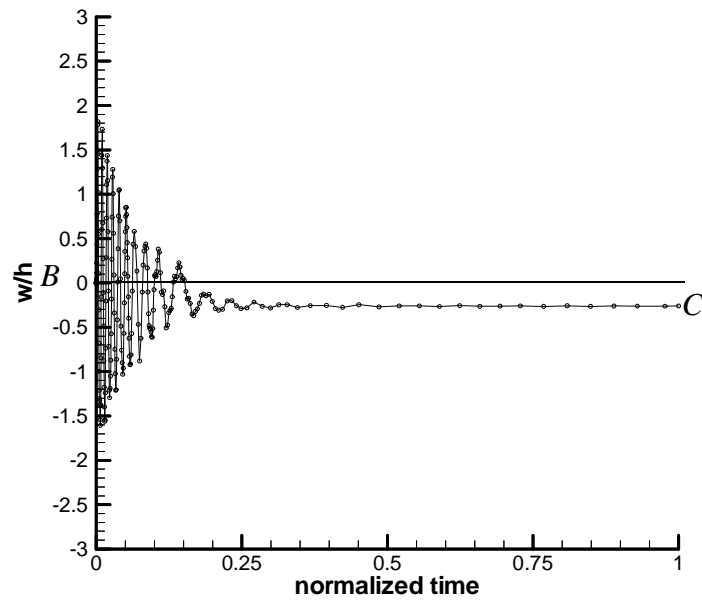
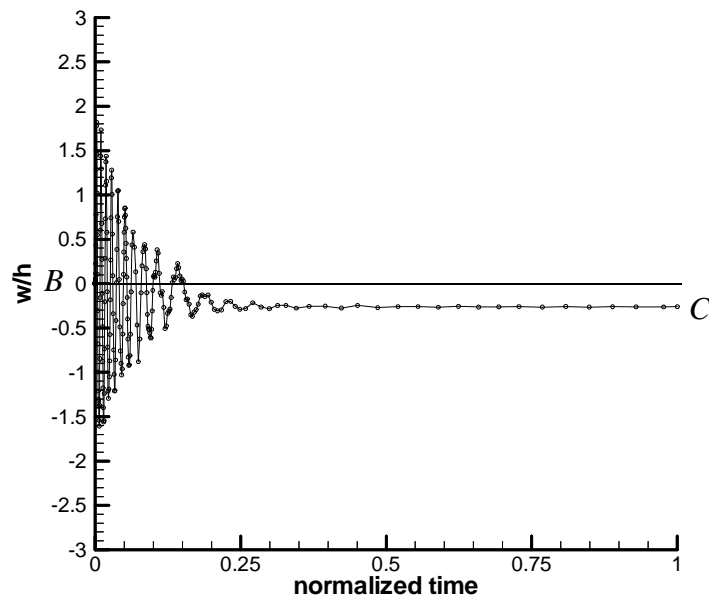


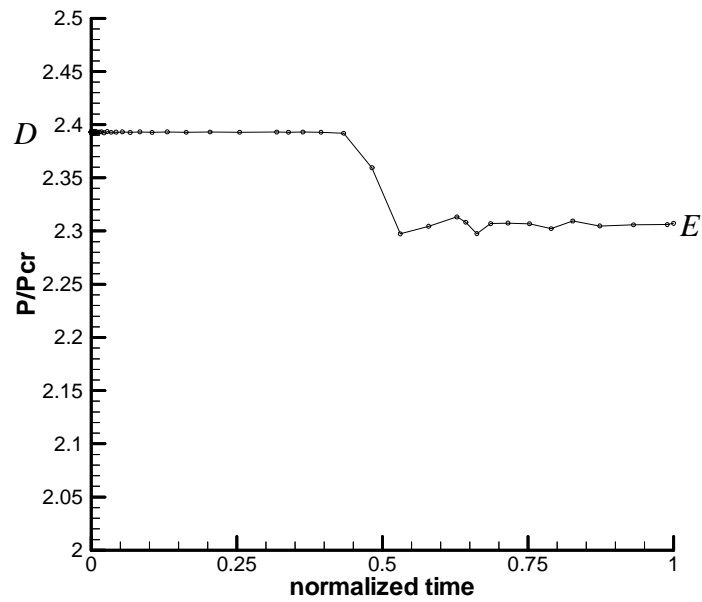
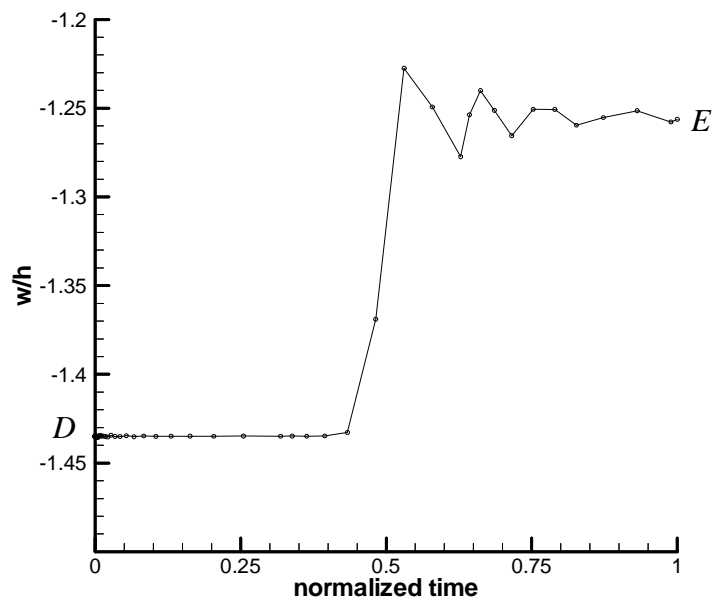
Fig. E.34 Transient response at II of a  $[0_4/90_4]_T$  laminate (CL-CL)

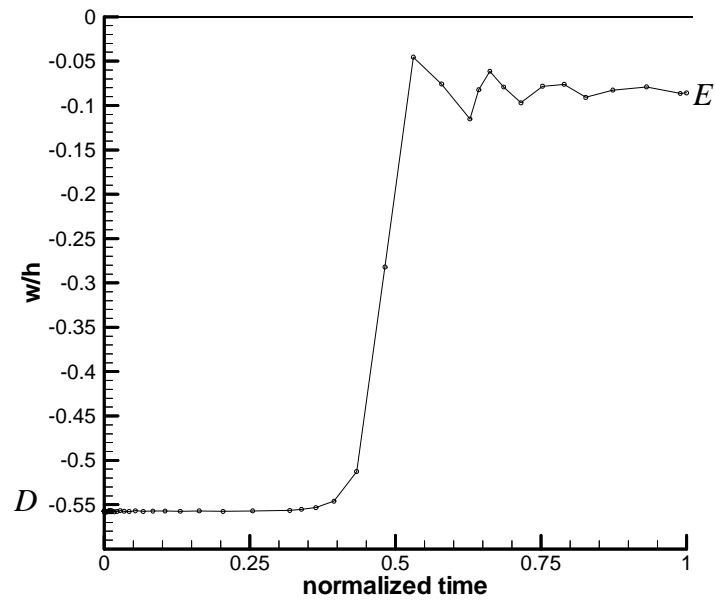
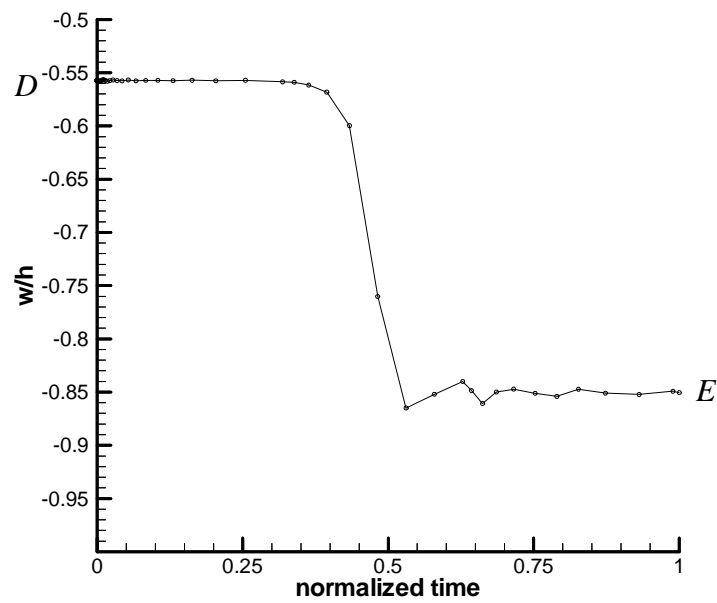
Fig. E.35 Transient response at III of a  $[0_4/90_4]_T$  laminate (CL-CL)Fig. E.36 Transient response at I of a  $[0_4/90_4]_T$  laminate (CL-CL)

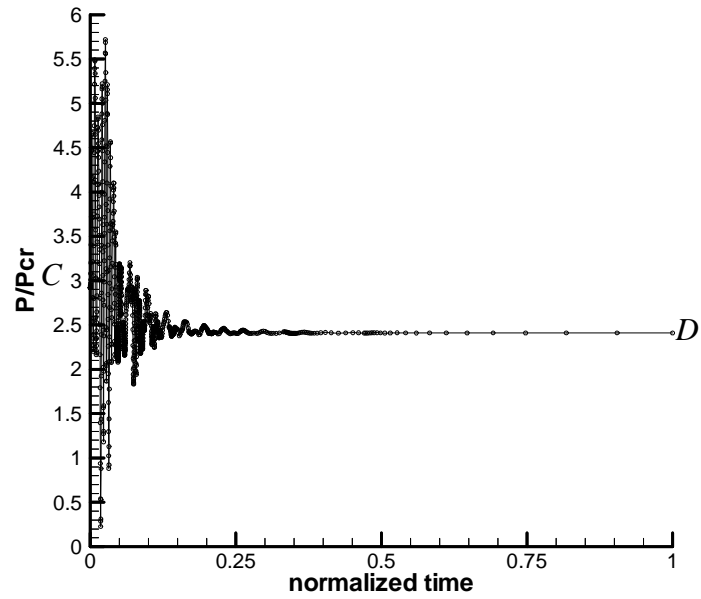
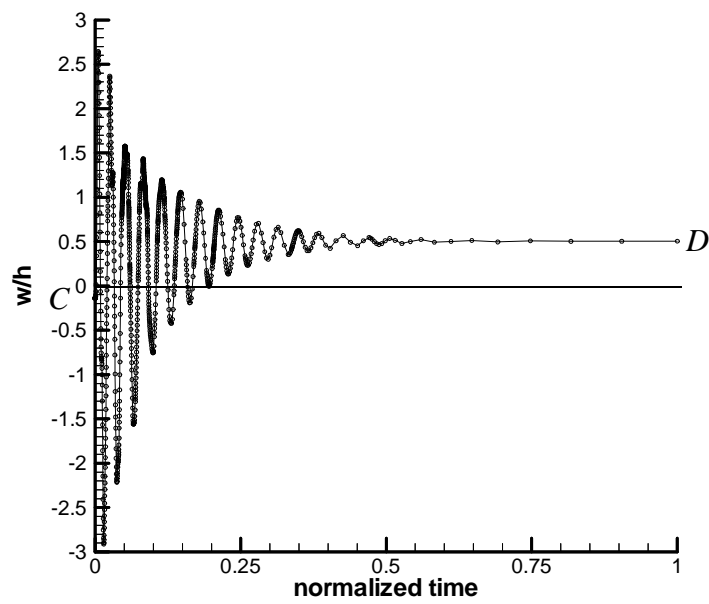
Fig. E.37 1st transient load response of a  $[0_4/90_4]_T$  laminate (CL-SS)Fig. E.38 1st transient response at II of a  $[0_4/90_4]_T$  laminate (CL-SS)

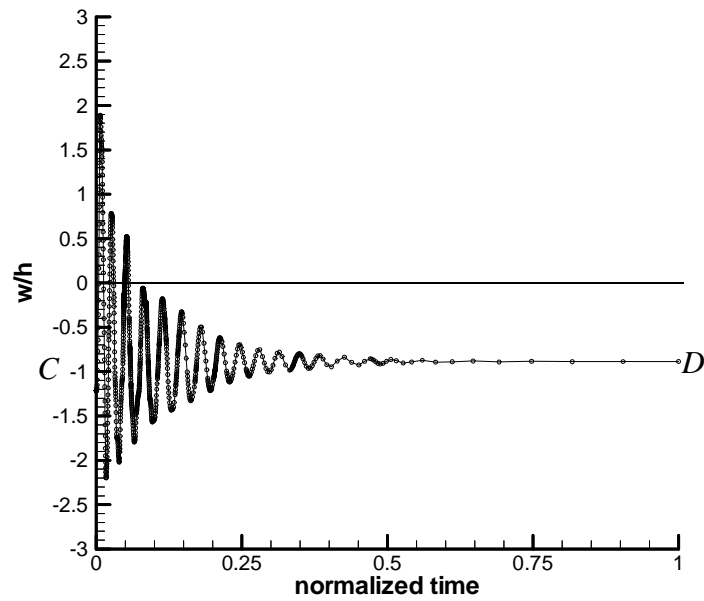
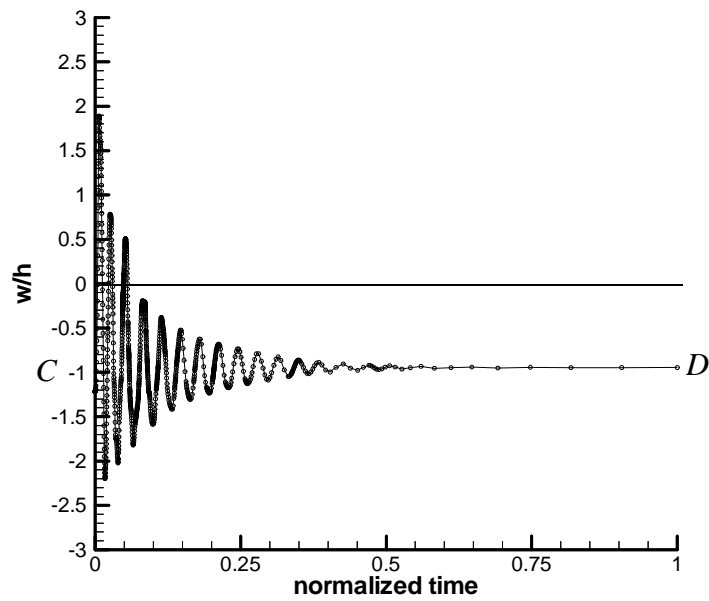


Fig. E.39 1st transient response at III of a  $[0_4/90_4]_T$  laminate (CL-SS)Fig. E.40 1st transient response at I of a  $[0_4/90_4]_T$  laminate (CL-SS)

Fig. E.41 2nd transient load response of a  $[0_4/90_4]_T$  laminate (CL-SS)Fig. E.42 2nd transient response at II of a  $[0_4/90_4]_T$  laminate (CL-SS)

Fig. E.43 2nd transient response at III of a  $[0_4/90_4]_T$  laminate (CL-SS)Fig. E.44 2nd transient response at I of a  $[0_4/90_4]_T$  laminate (CL-SS)

Fig. E.45 Transient load response of a  $[0_4/90_4]_T$  laminate (SS-SS)Fig. E.46 Transient response at II of a  $[0_4/90_4]_T$  laminate (SS-SS)

Fig. E.47 Transient response at III of a  $[0_4/90_4]_T$  laminate (SS-SS)Fig. E.48 Transient response at I of a  $[0_4/90_4]_T$  laminate (SS-SS)

## Appendix F: Dynamic Response of Angle-Ply Laminates

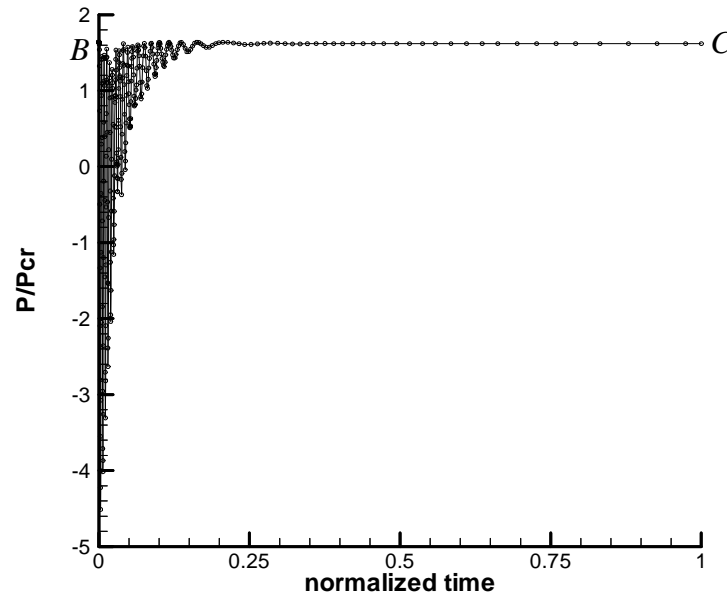


Fig. F.1 Transient load response of a  $[\pm 30_2]_S$  laminate (CL-CL)

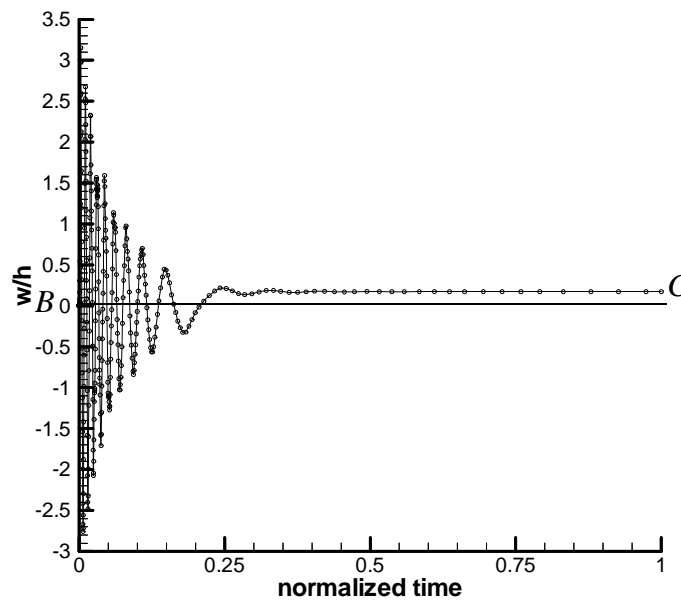
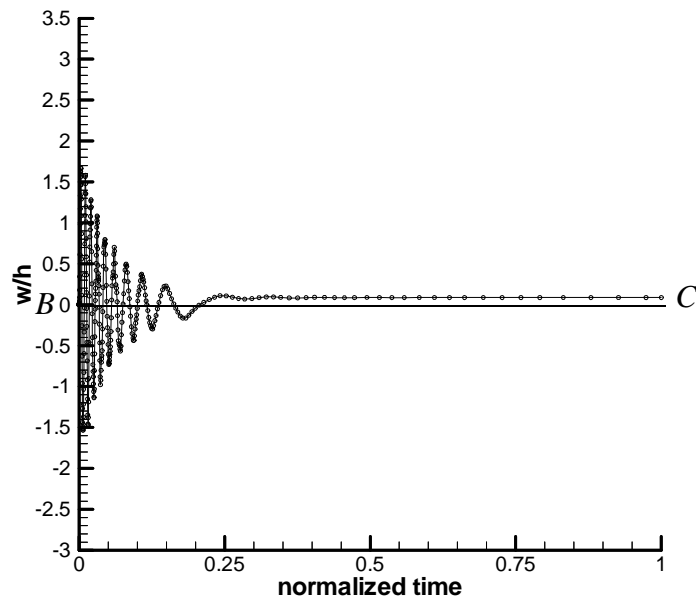
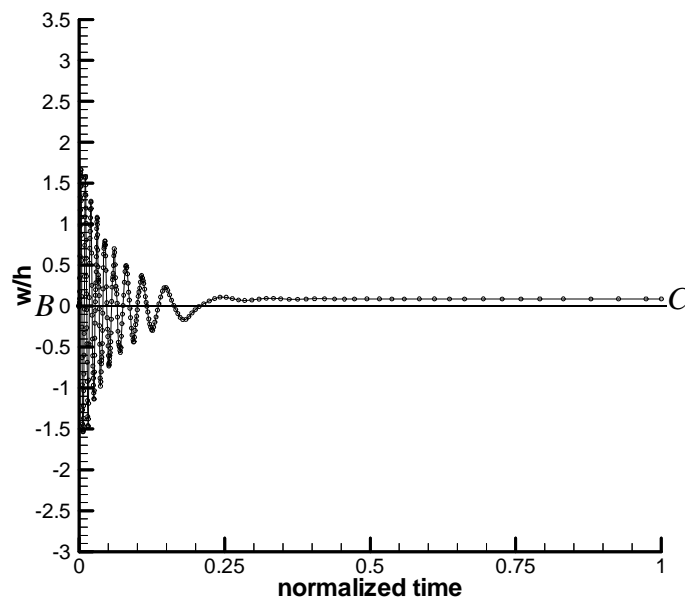


Fig. F.2 Transient response at II of a  $[\pm 30_2]_S$  laminate (CL-CL)

Fig. F.3 Transient response at III of a  $[\pm 30_2]_S$  laminate (CL-CL)Fig. F.4 Transient response at I of a  $[\pm 30_2]_S$  laminate (CL-CL)

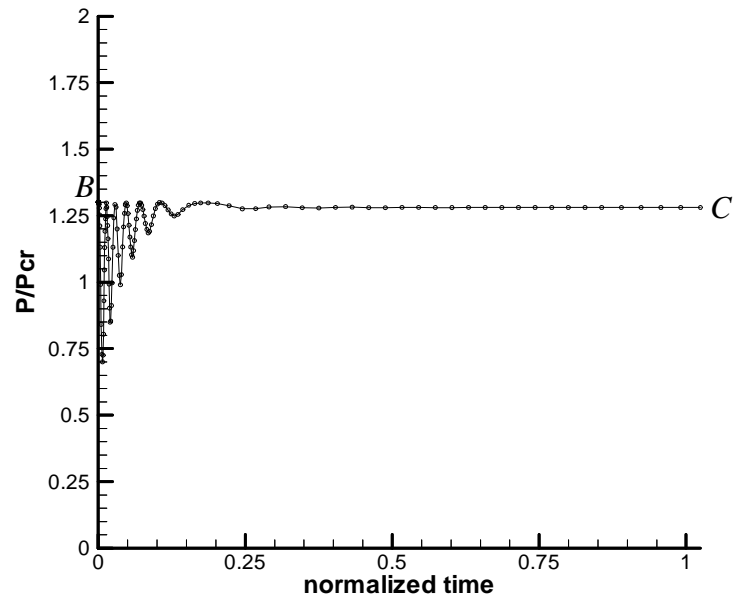


Fig. F.5 Transient load response of a  $[\pm 30_2]_S$  laminate (CL-SS)

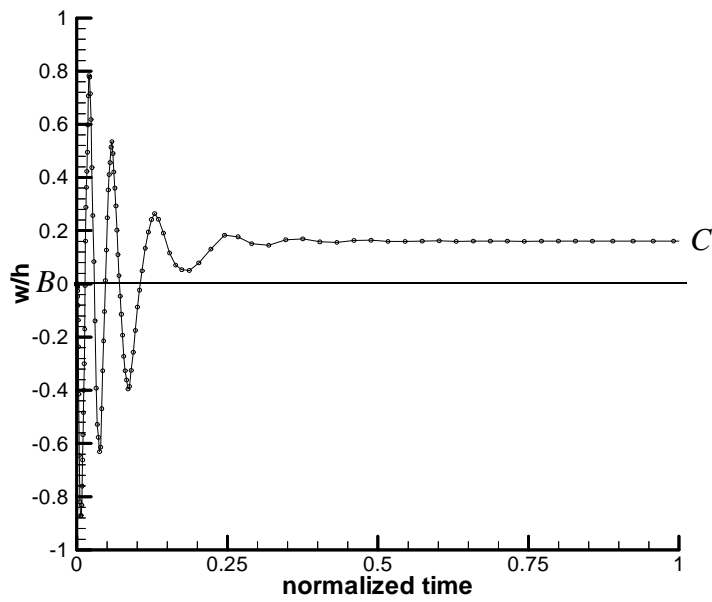
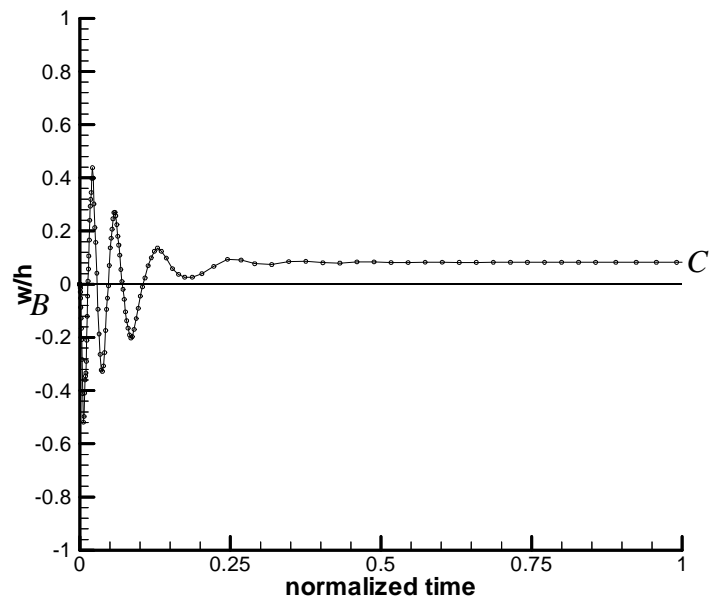
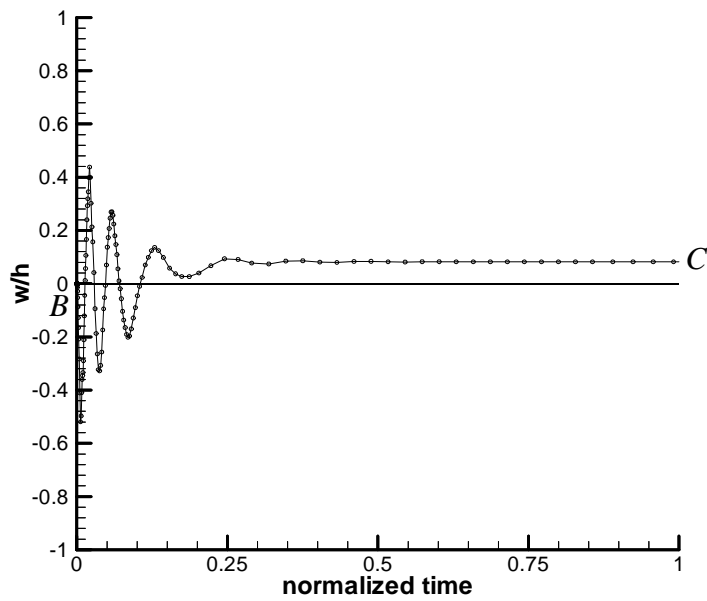


Fig. F.6 Transient response at II of a  $[\pm 30_2]_S$  laminate (CL-SS)



Fig. F.7 Transient response at III of a  $[\pm 30_2]_S$  laminate (CL-SS)Fig. F.8 Transient response at I of a  $[\pm 30_2]_S$  laminate (CL-SS)

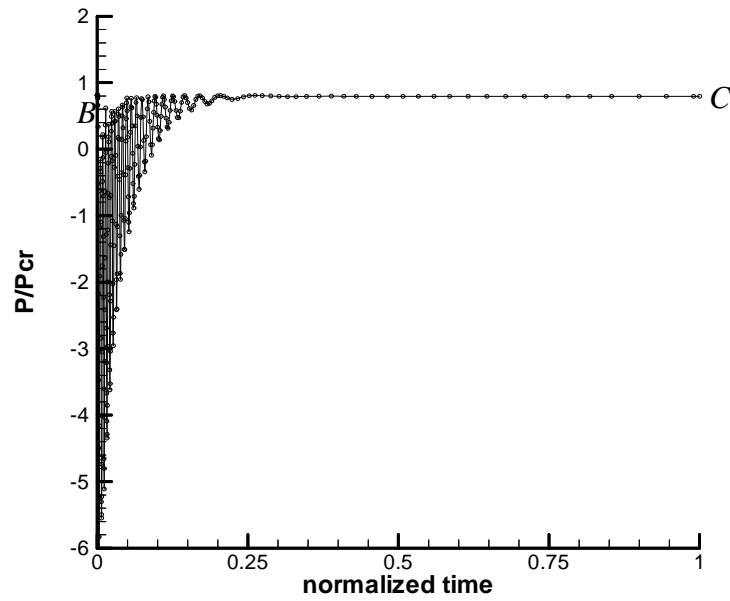


Fig. F.9 Transient load response of a  $[\pm 30_2]_S$  laminate (SS-SS)

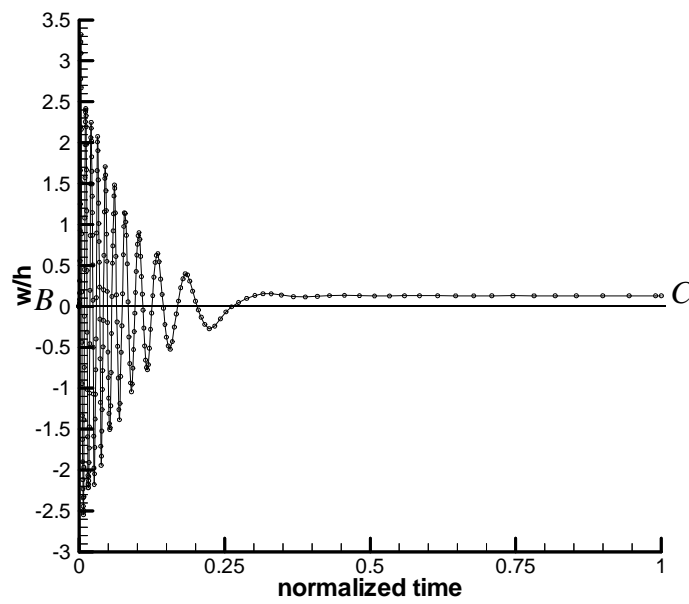
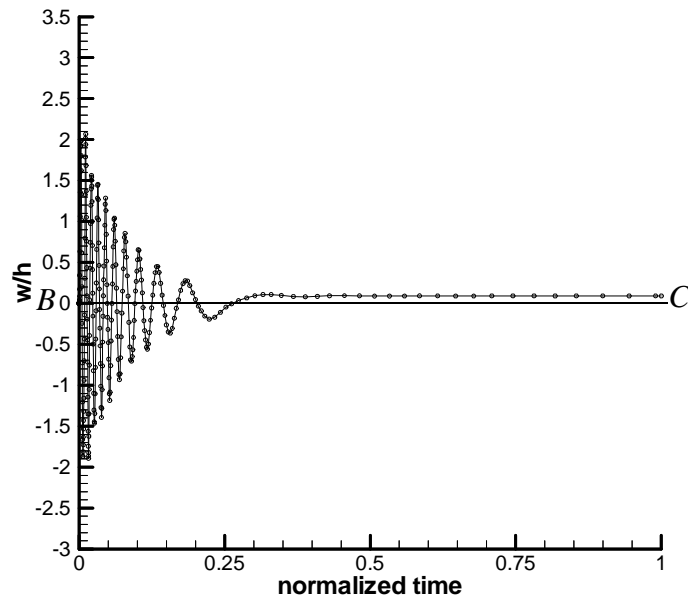
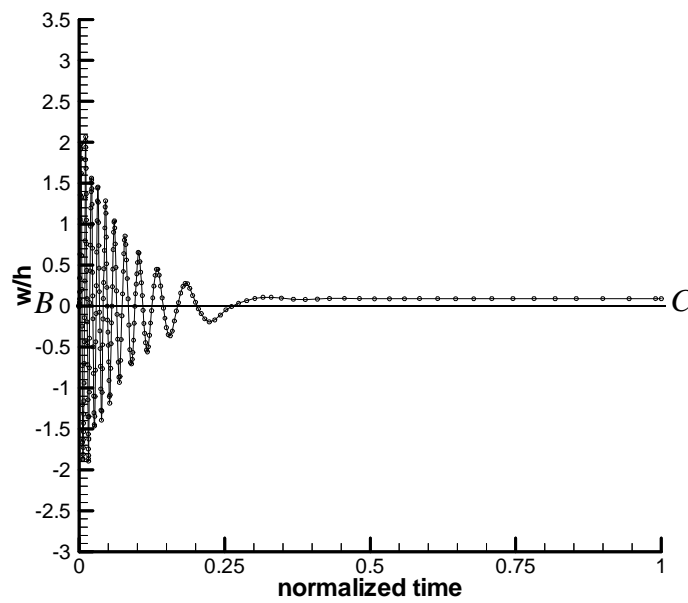


Fig. F.10 Transient response at II of a  $[\pm 30_2]_S$  laminate (SS-SS)

Fig. F.11 Transient response at III of a  $[\pm 30_2]_S$  laminate (SS-SS)Fig. F.12 Transient response at I of a  $[\pm 30_2]_S$  laminate (SS-SS)

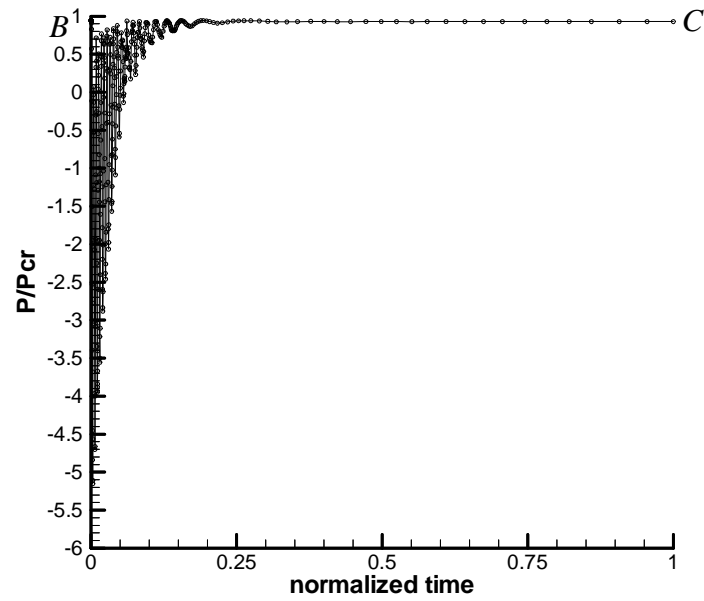


Fig. F.13 Transient load response of a  $[+30_4/-30_4]_T$  laminate (CL-CL)

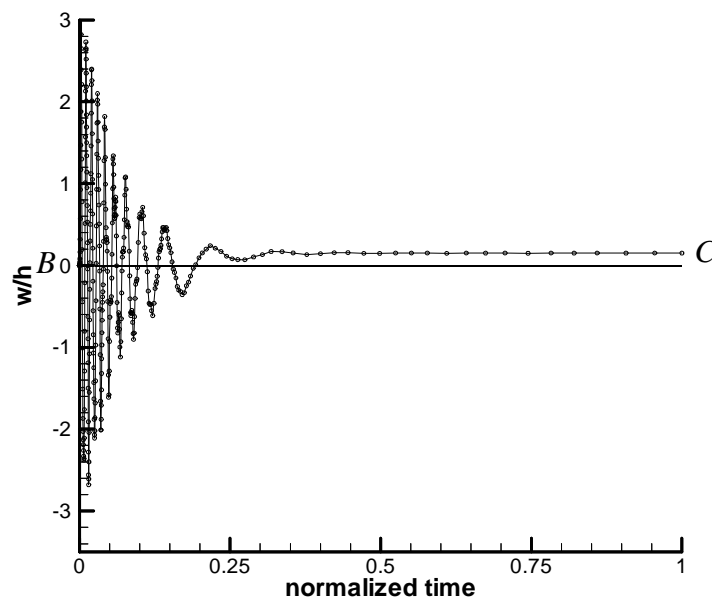
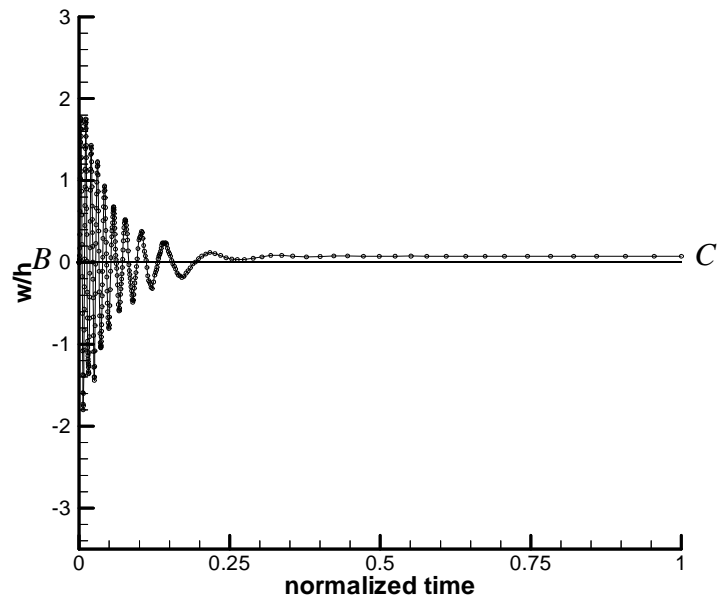
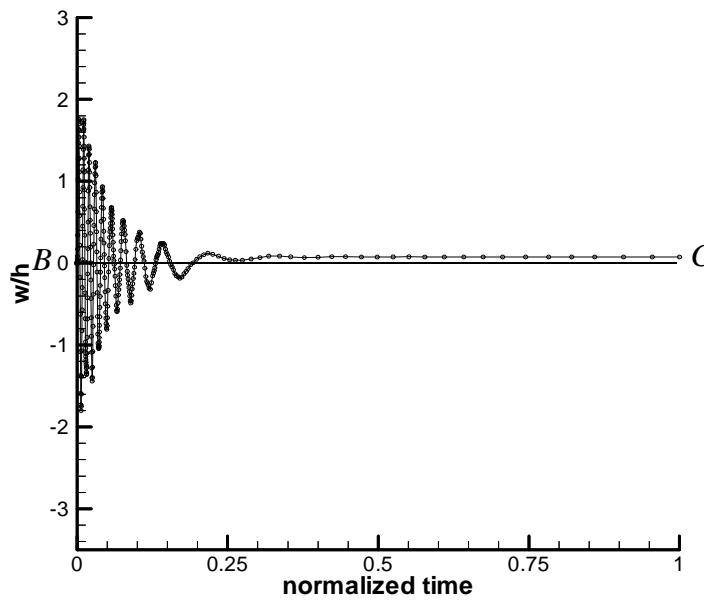


Fig. F.14 Transient response at II of a  $[+30_4/-30_4]_T$  laminate (CL-CL)

Fig. F.15 Transient response at III of a  $[+30_4/-30_4]_T$  laminate (CL-CL)Fig. F.16 Transient response at I of a  $[+30_4/-30_4]_T$  laminate (CL-CL)

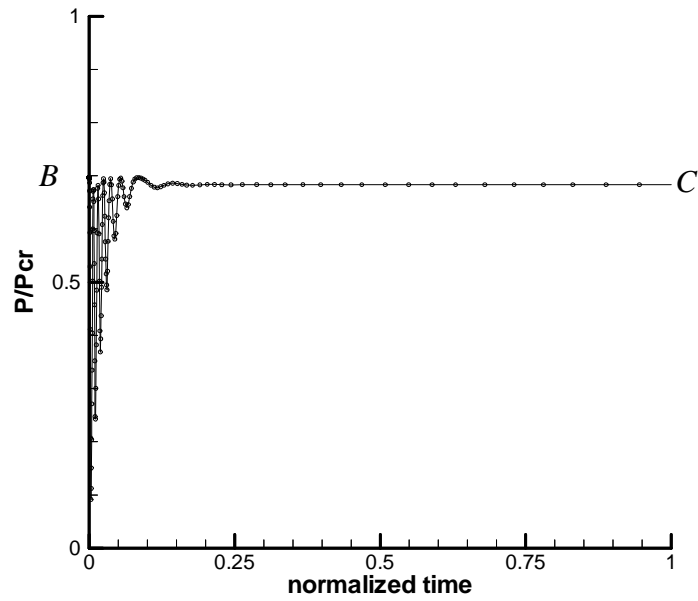


Fig. F.17 1st transient load response of a  $[+30_4/-30_4]_T$  laminate (CL-SS)

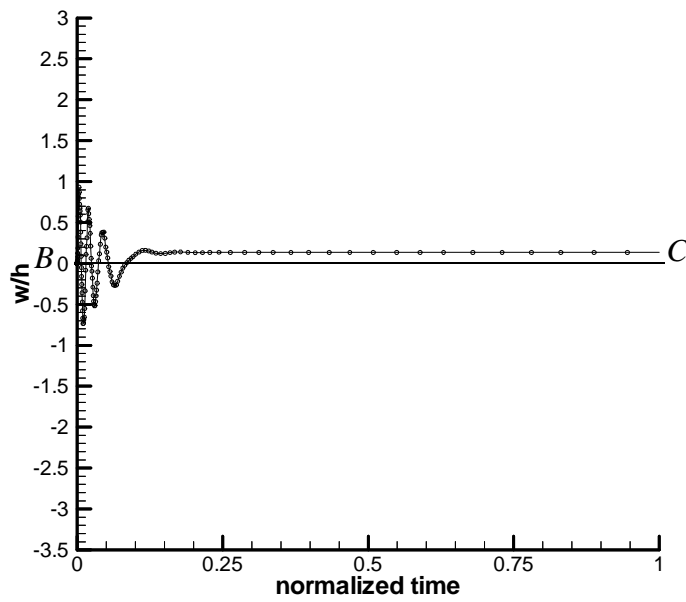
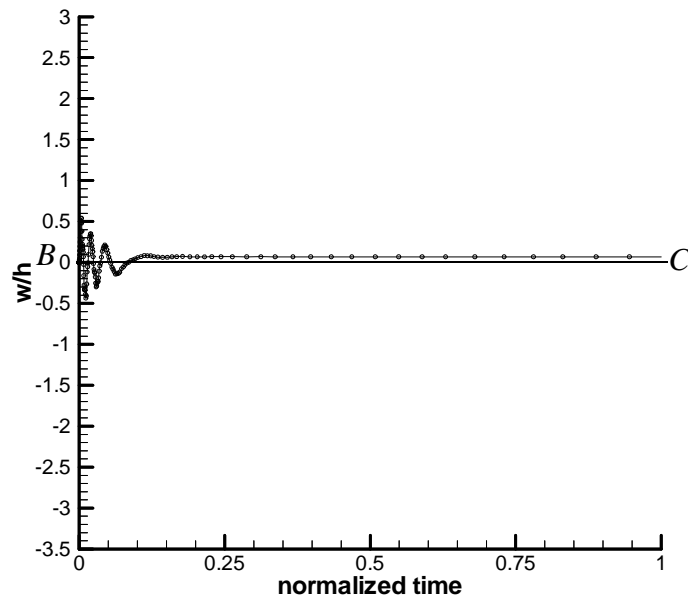
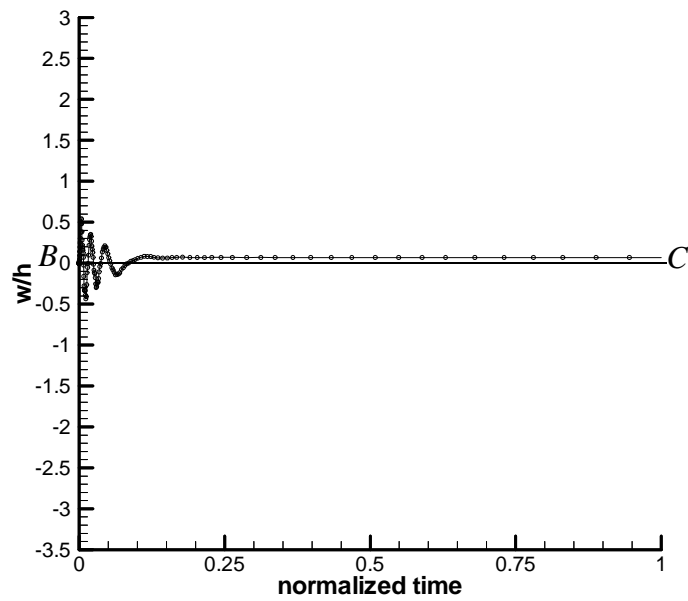
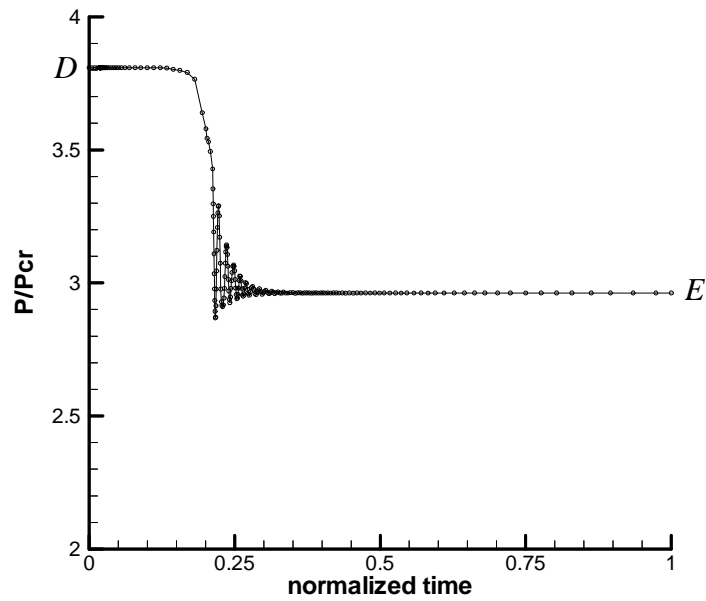
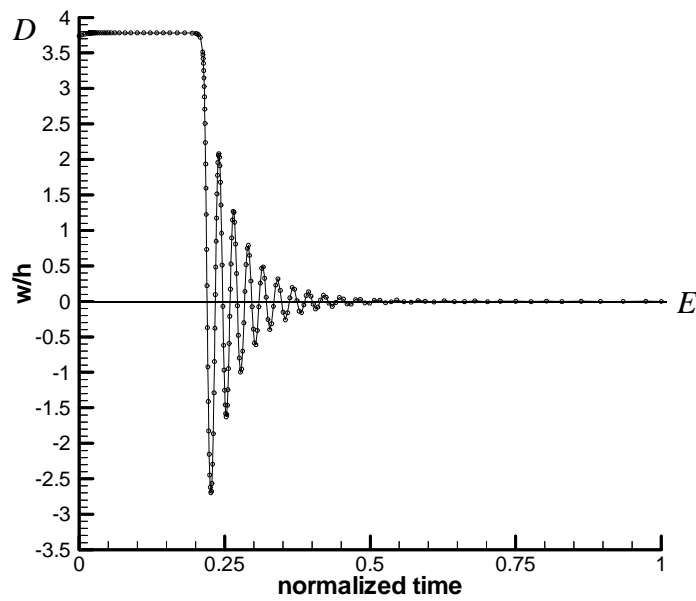
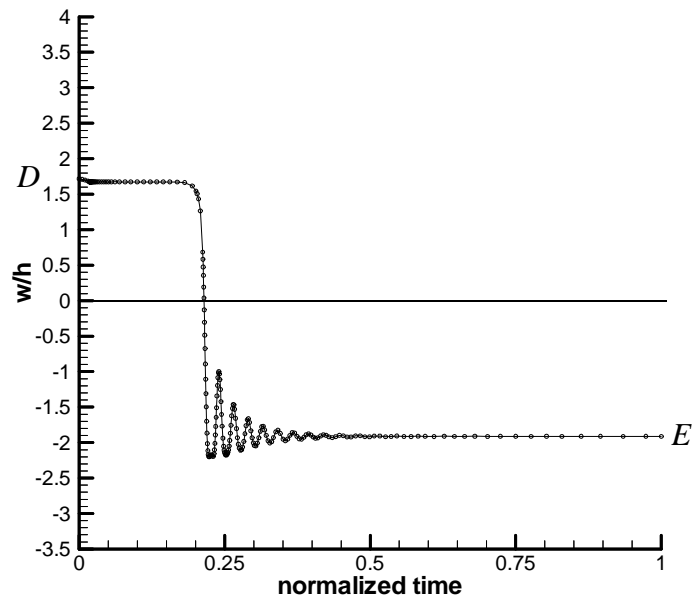
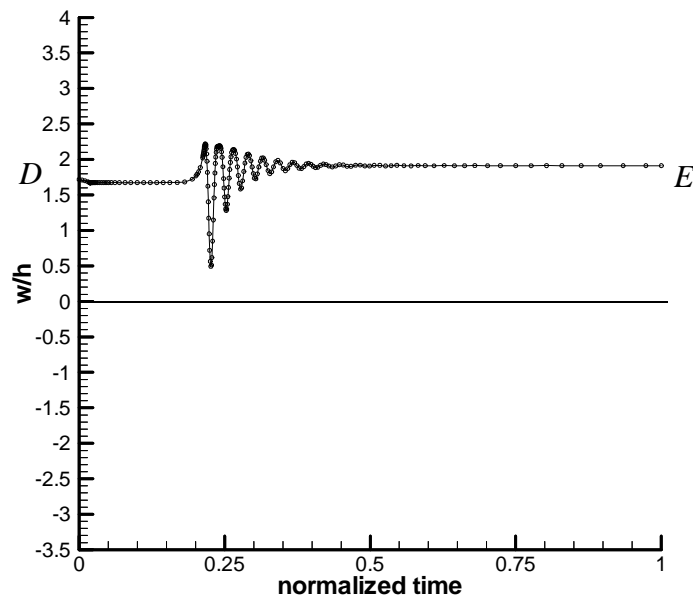


Fig. F.18 1st transient response at II of a  $[+30_4/-30_4]_T$  laminate (CL-SS)

Fig. F.19 1st transient response at III of a  $[+30_4/-30_4]_T$  laminate (CL-SS)Fig. F.20 1st transient response at I of a  $[+30_4/-30_4]_T$  laminate (CL-SS)

Fig. F.21 2nd transient load response of a  $[+30_4/-30_4]_T$  laminate (CL-SS)Fig. F.22 2nd transient response at II of a  $[+30_4/-30_4]_T$  laminate (CL-SS)



Fig. F.23 2nd transient response at III of a  $[+30_4/-30_4]_T$  laminate (CL-SS)Fig. F.24 2nd transient response at I of a  $[+30_4/-30_4]_T$  laminate (CL-SS)

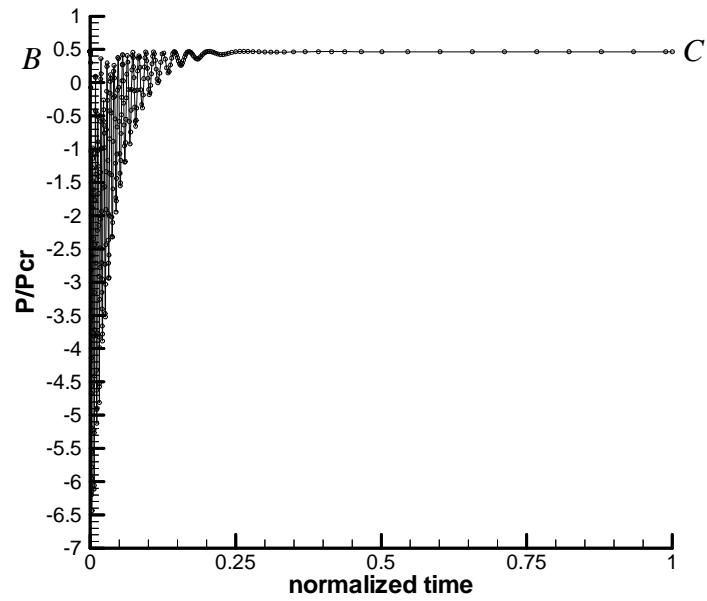


Fig. F.25 1st transient load response of a  $[+30_4/-30_4]_T$  laminate (SS-SS)

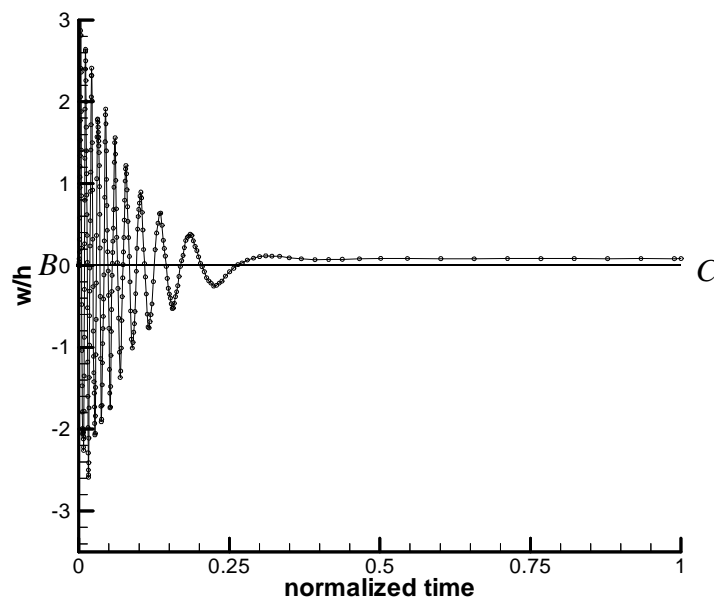
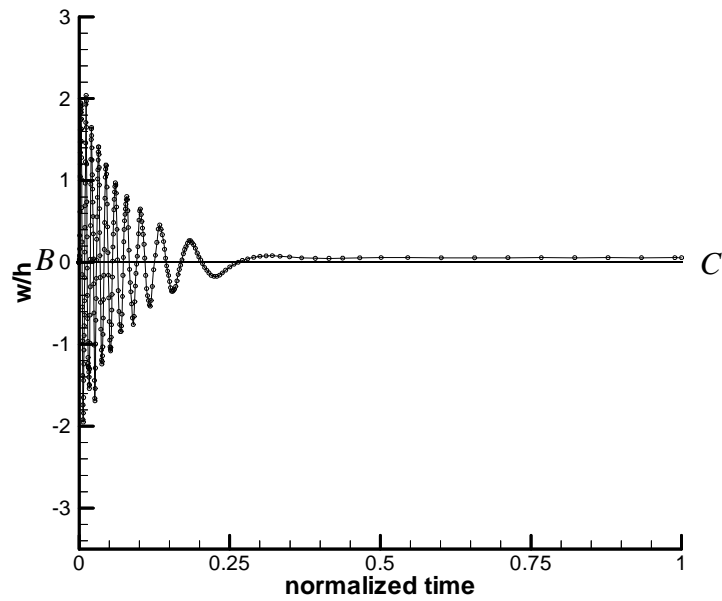
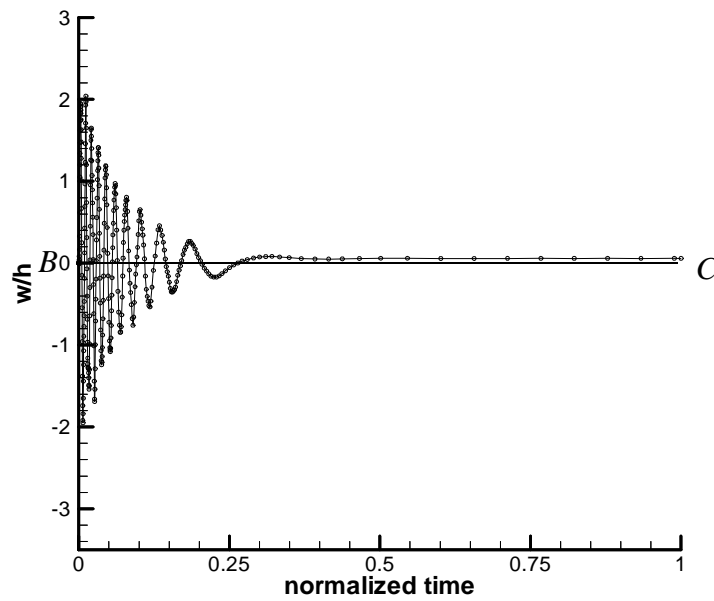
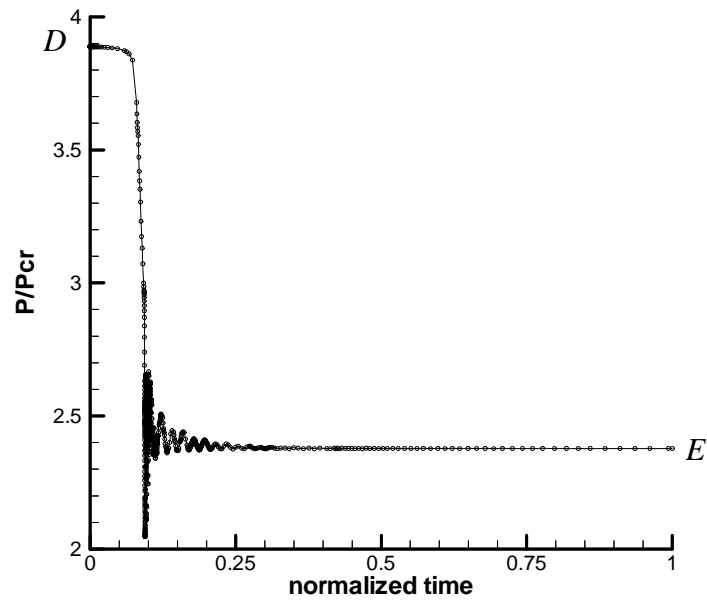
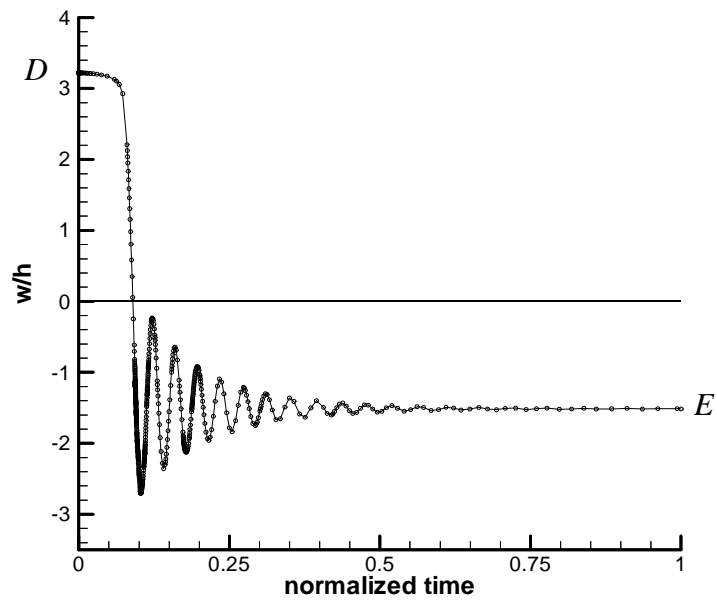
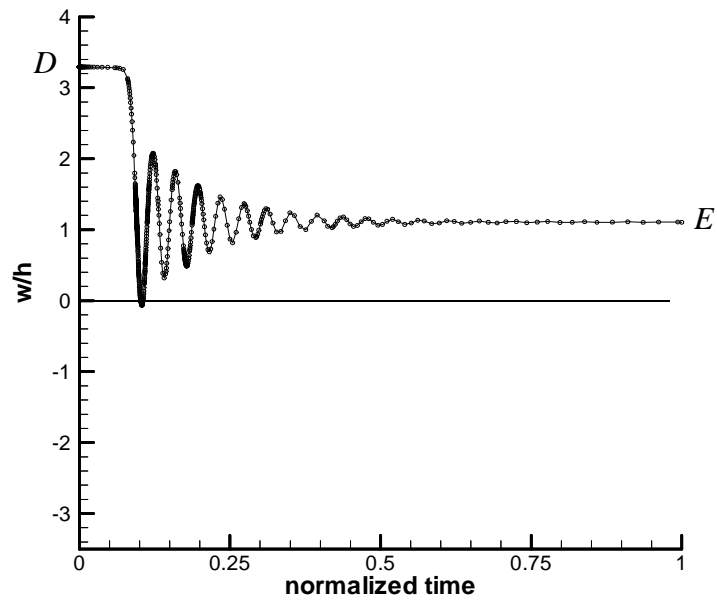
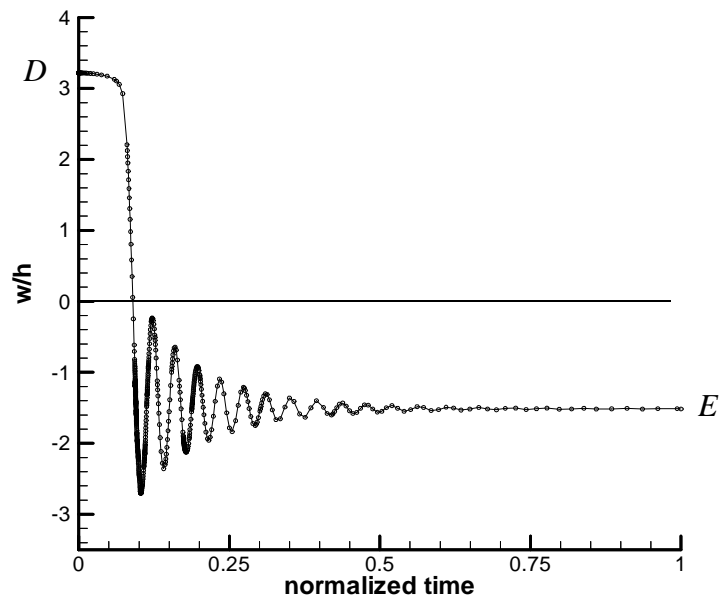


Fig. F.26 1st transient response at II of a  $[+30_4/-30_4]_T$  laminate (SS-SS)

Fig. F.27 1st transient response at III of a  $[+30_4/-30_4]_T$  laminate (SS-SS)Fig. F.28 1st transient response at I of a  $[+30_4/-30_4]_T$  laminate (SS-SS)

Fig. F.29 2nd transient load response of a  $[+30_4/-30_4]_T$  laminate (SS-SS)Fig. F.30 2nd transient response at II of a  $[+30_4/-30_4]_T$  laminate (SS-SS)

Fig. F.31 2nd transient response at III of a  $[+30_4/-30_4]_T$  laminate (SS-SS)Fig. F.32 2nd transient response at I of a  $[+30_4/-30_4]_T$  laminate (SS-SS)

## Appendix G: Dynamic Response of Unsymmetric Laminates

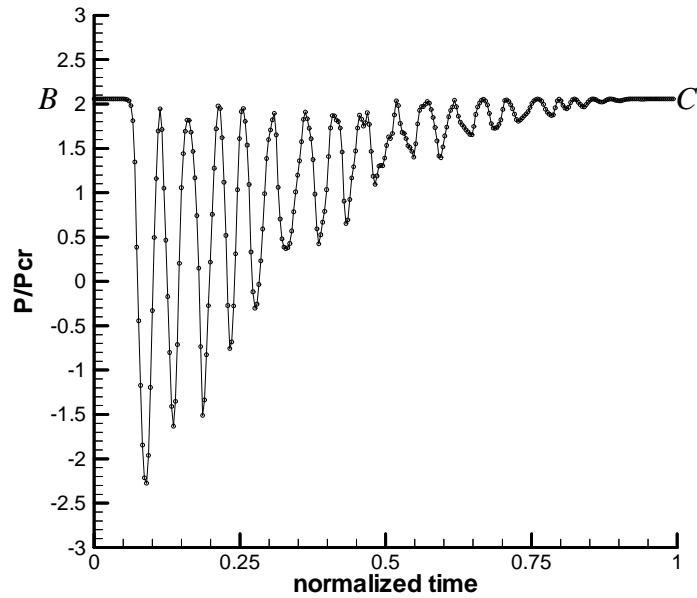


Fig. G.1 1st transient load response of a  $[\pm 30/90/0]_{2T}$  laminate (CL-CL)

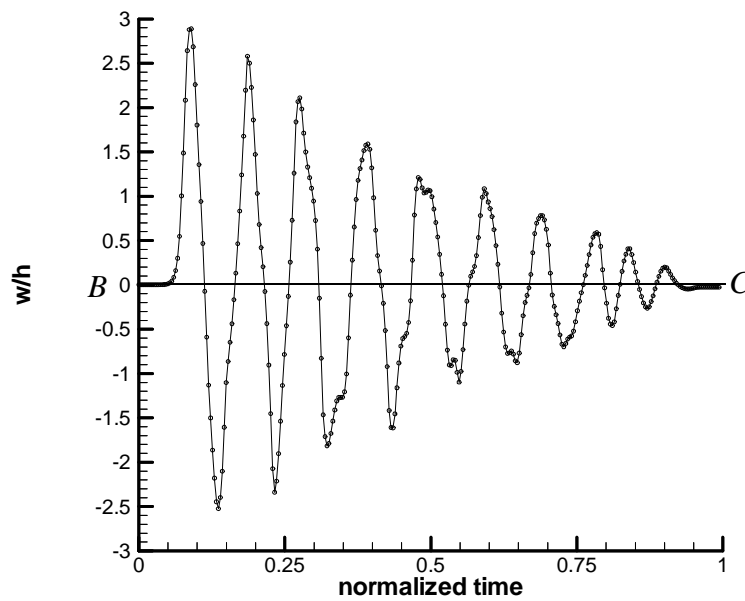
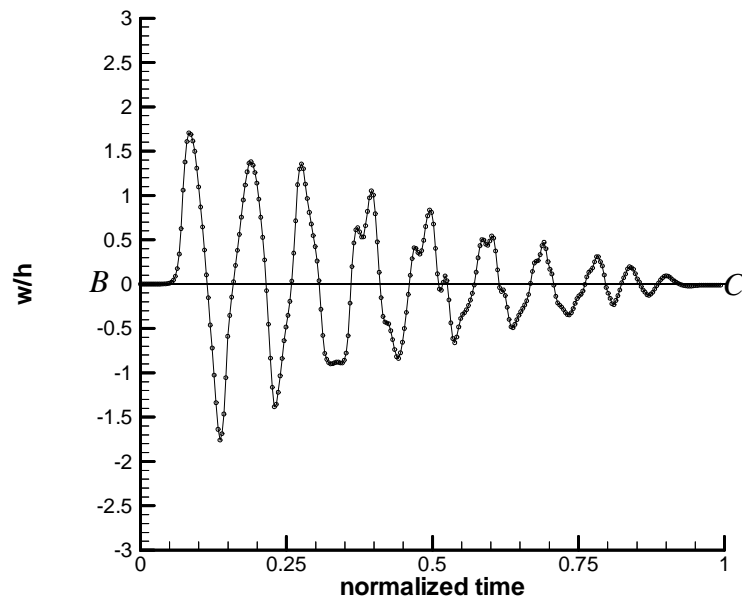
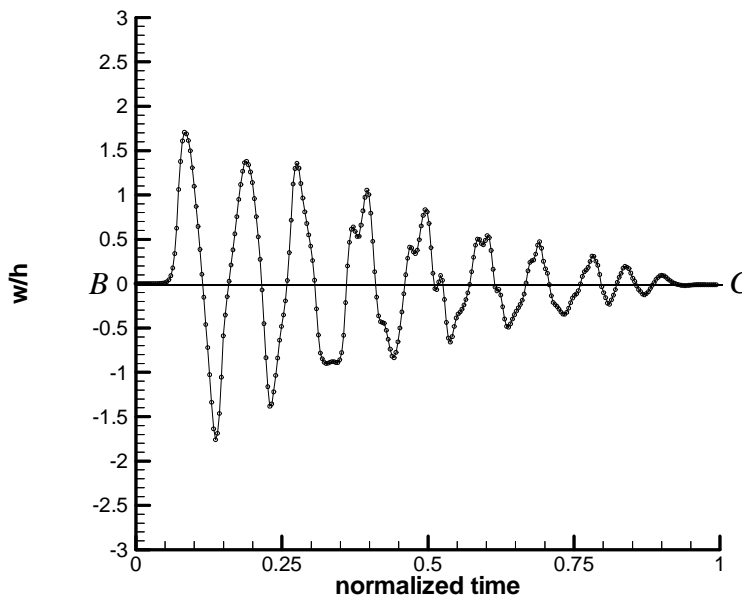


Fig. G.2 1st transient response at II of a  $[\pm 30/90/0]_{2T}$  laminate (CL-CL)

Fig. G.3 1st transient response at III of a  $[\pm 30/90/0]_{2T}$  laminate (CL-CL)Fig. G.4 1st transient response at I of a  $[\pm 30/90/0]_{2T}$  laminate (CL-CL)

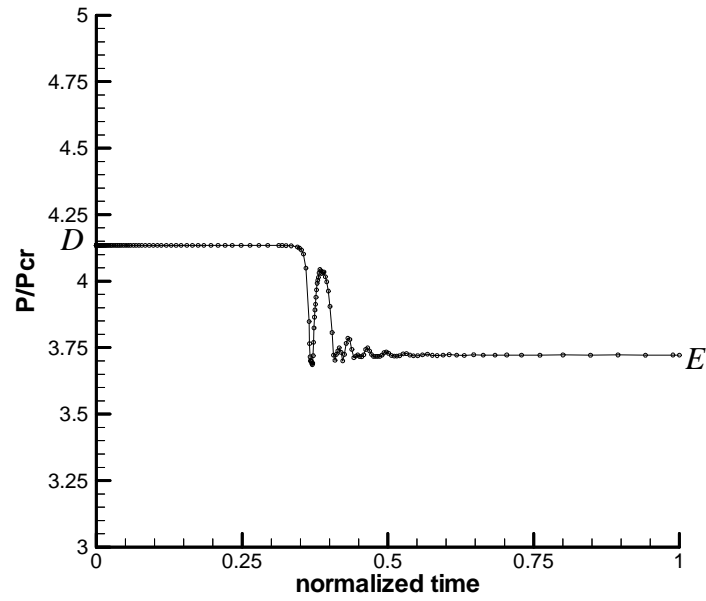


Fig. G.5 2nd transient load response of a  $[\pm 30/90/0]_{2T}$  laminate (CL-CL)

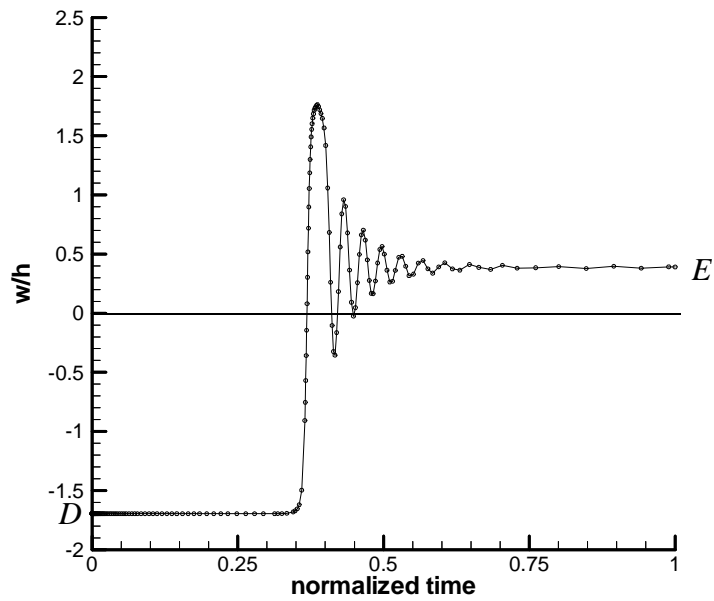


Fig. G.6 2nd transient response at II of a  $[\pm 30/90/0]_{2T}$  laminate (CL-CL)



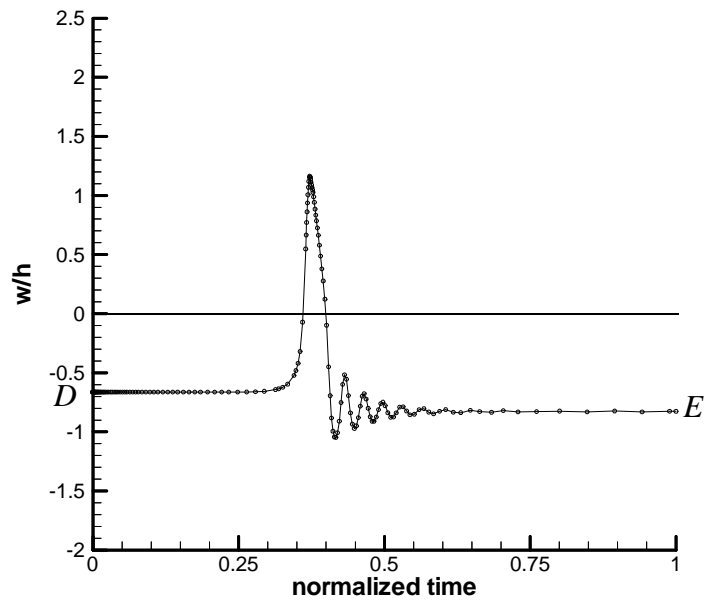


Fig. G.7 2nd transient response at III of a  $[\pm 30/90/0]_{2T}$  laminate (CL-CL)

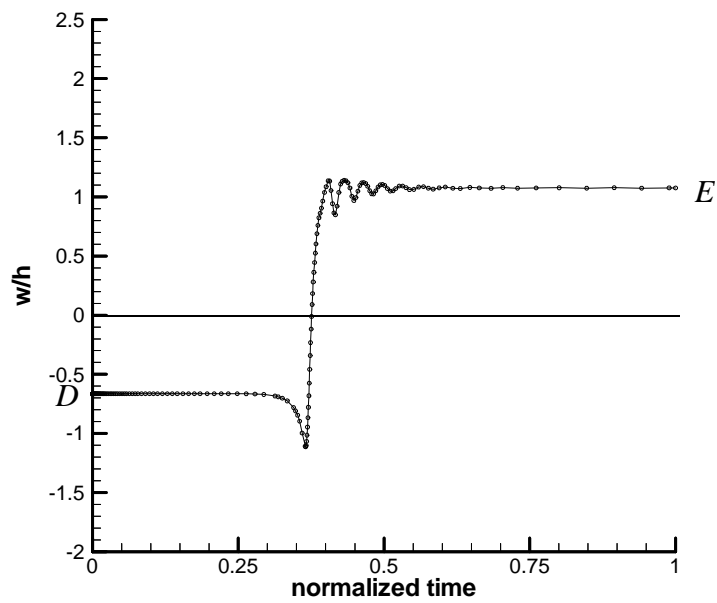


Fig. G.8 2nd transient response at I of a  $[\pm 30/90/0]_{2T}$  laminate (CL-CL)

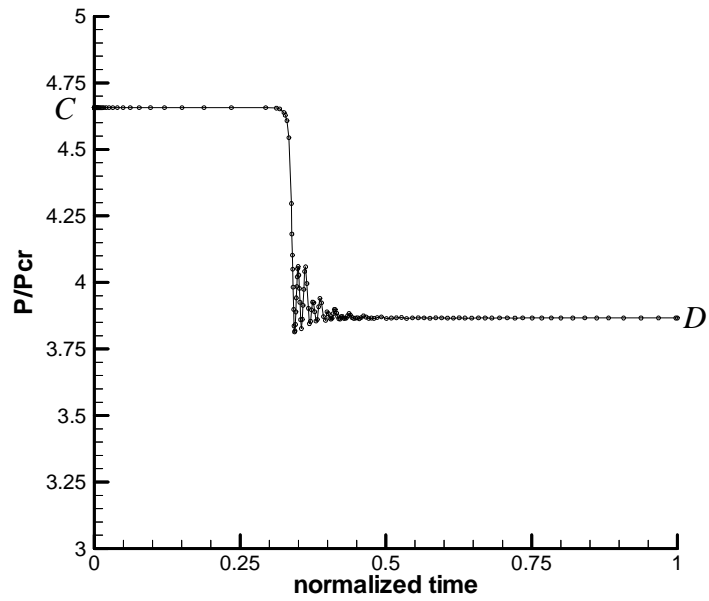


Fig. G.9 Transient load response of a  $[\pm 30/90/0]_{2T}$  laminate (CL-SS)

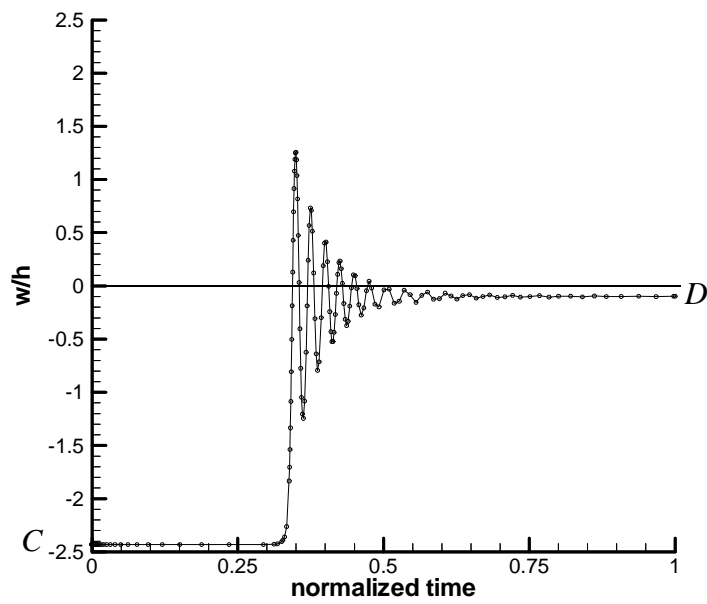
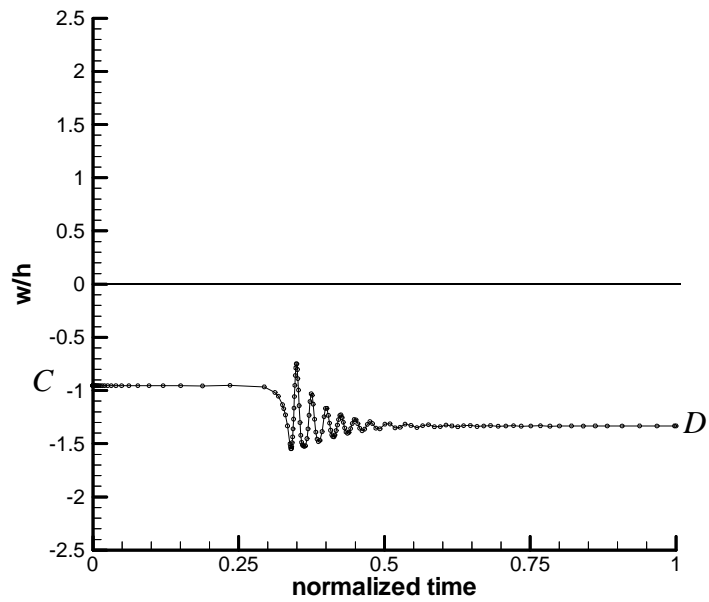
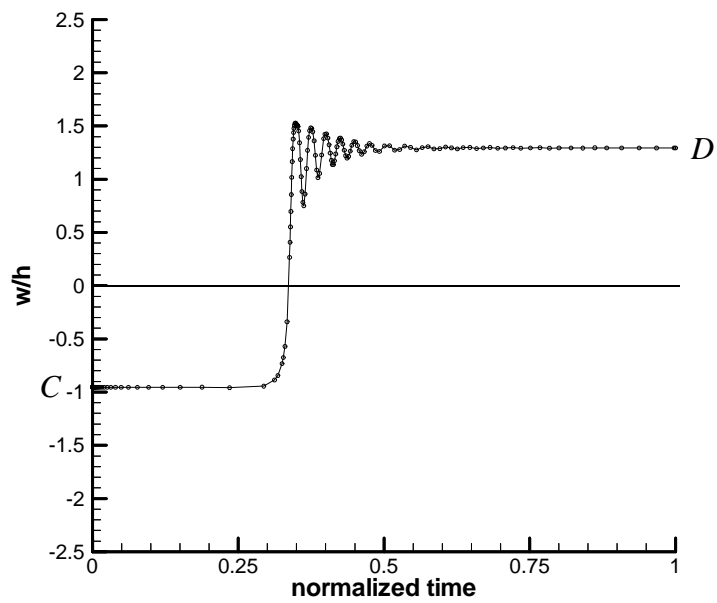


Fig. G.10 Transient response at II of a  $[\pm 30/90/0]_{2T}$  laminate (CL-SS)

Fig. G.11 Transient response at III of a  $[\pm 30/90/0]_{2T}$  laminate (CL-SS)Fig. G.12 Transient response at I of a  $[\pm 30/90/0]_{2T}$  laminate (CL-SS)

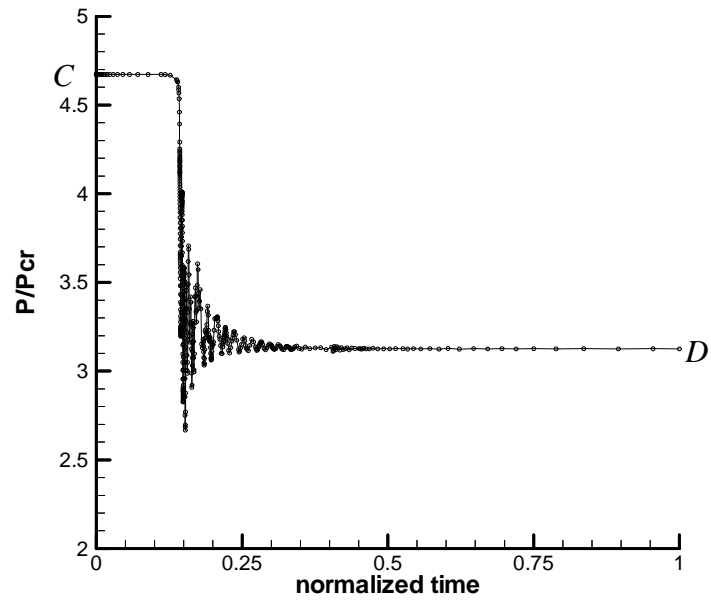


Fig. G.13 Transient load response of a  $[\pm 30/90/0]_{2T}$  laminate (SS-SS)

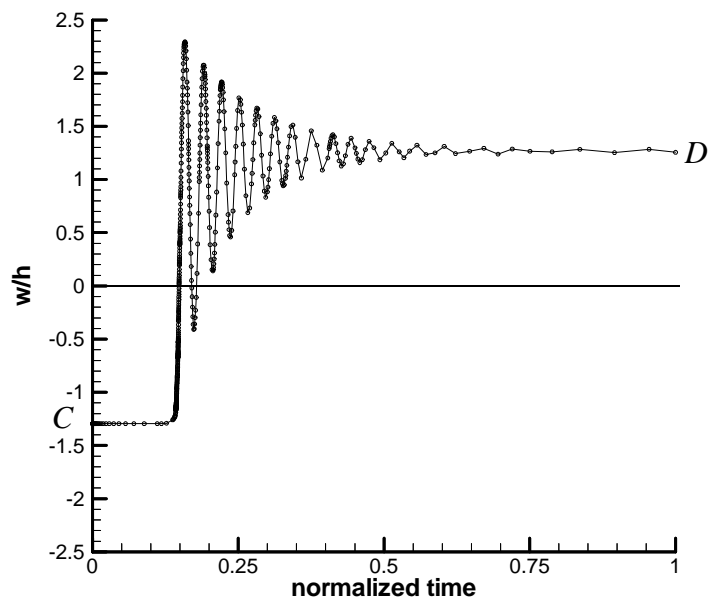


Fig. G.14 Transient response at II of a  $[\pm 30/90/0]_{2T}$  laminate (SS-SS)

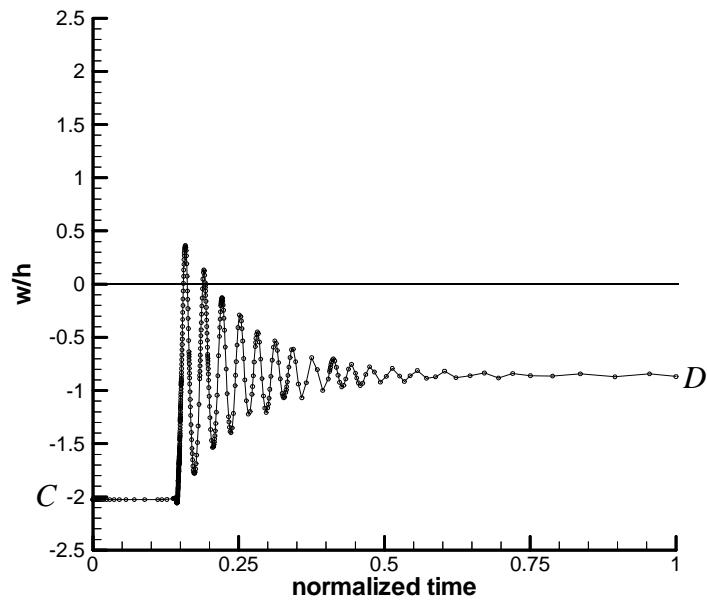


Fig. G.15 Transient response at III of a  $[\pm 30/90/0]_{2T}$  laminate (SS-SS)

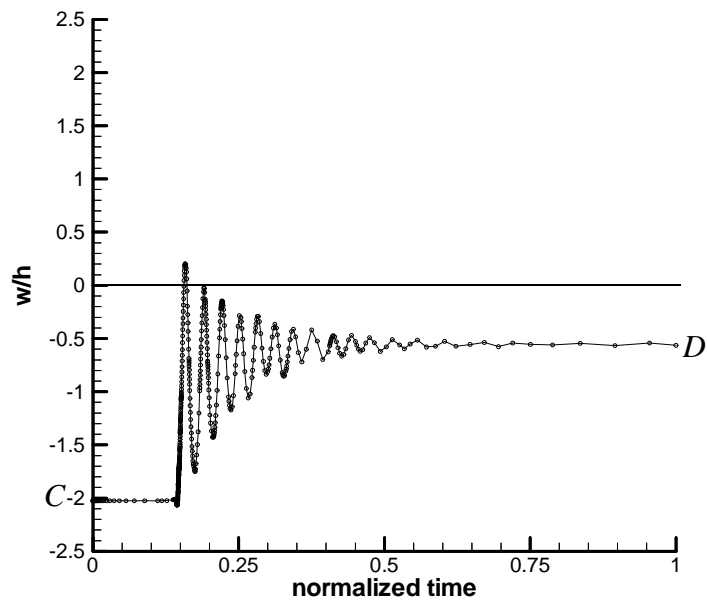


Fig. G.16 Transient response at I of a  $[\pm 30/90/0]_{2T}$  laminate (SS-SS)

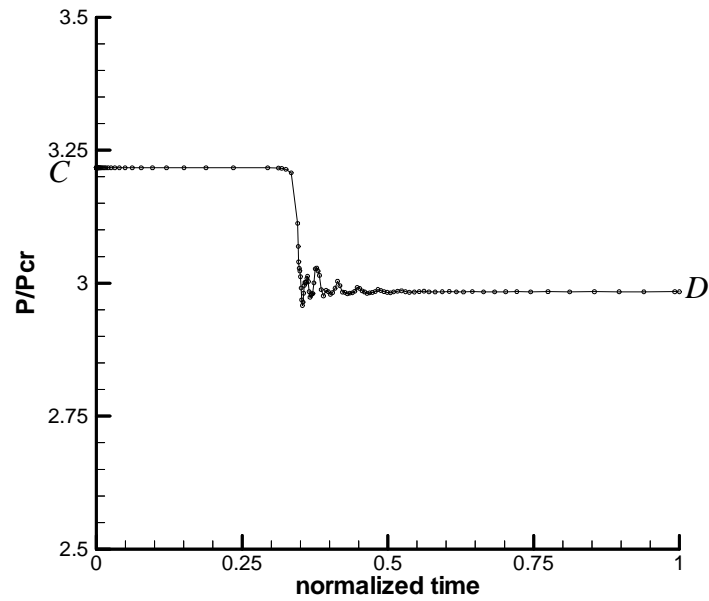


Fig. G.17 Transient load response of a  $[30_2/90/0]_{2T}$  laminate (CL-CL)

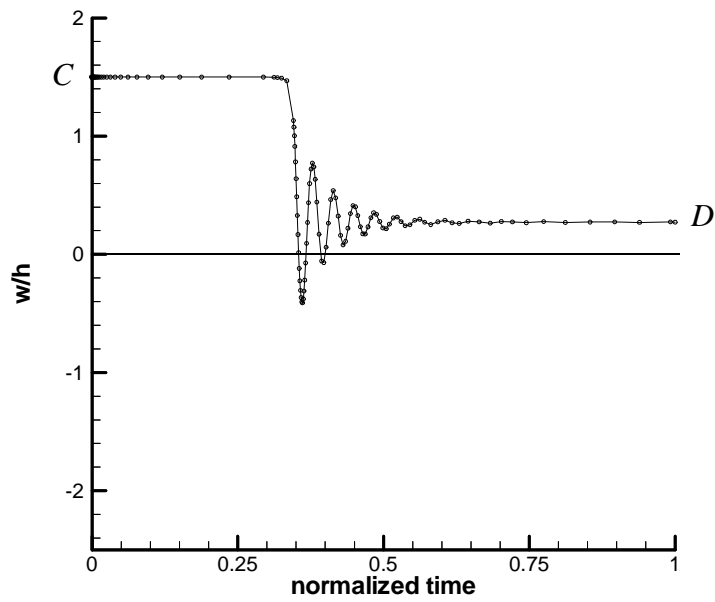


Fig. G.18 Transient response at II of a  $[30_2/90/0]_{2T}$  laminate (CL-CL)

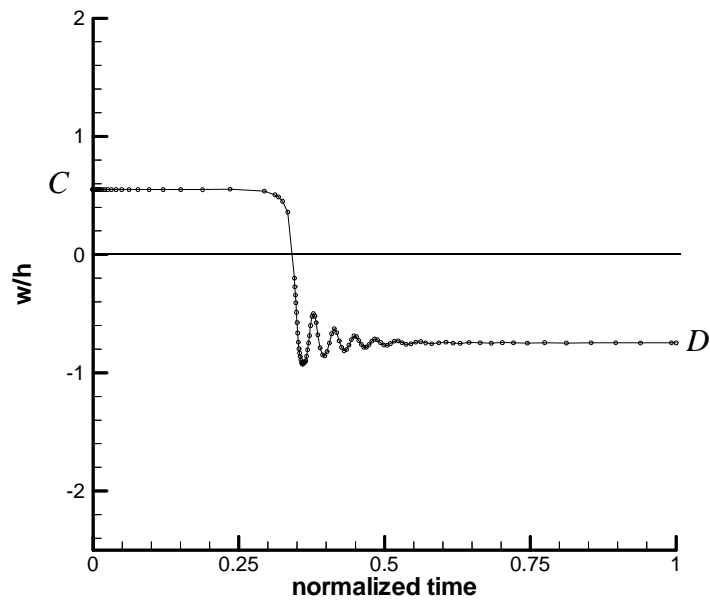


Fig. G.19 Transient response at III of a  $[30_2/90/0]_{2T}$  laminate (CL-CL)

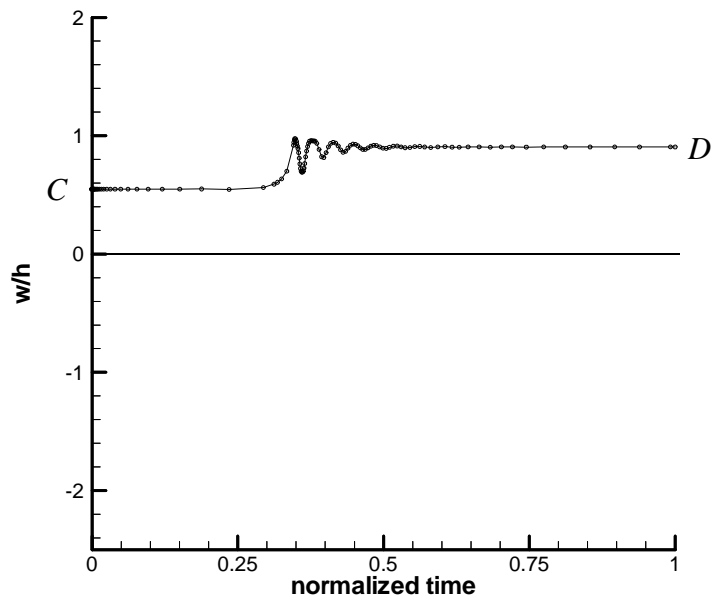


Fig. G.20 Transient response at I of a  $[30_2/90/0]_{2T}$  laminate (CL-CL)

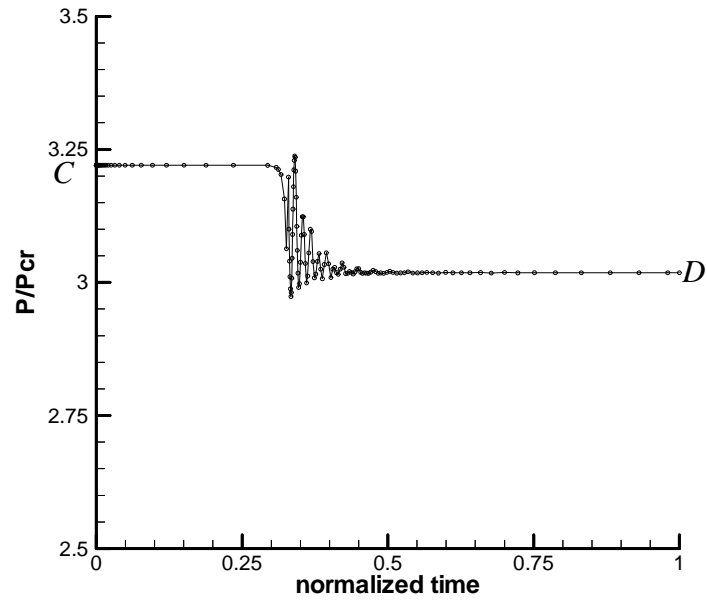


Fig. G.21 Transient load response of a  $[30_2/90/0]_{2T}$  laminate (CL-SS)

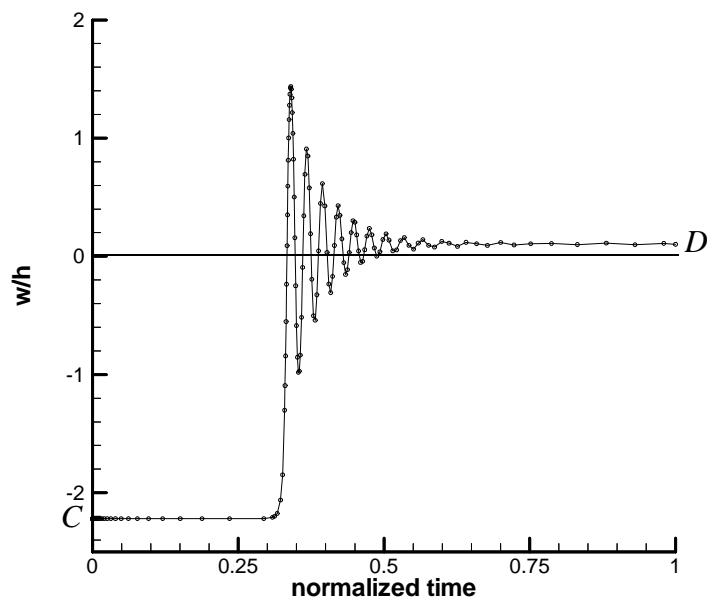
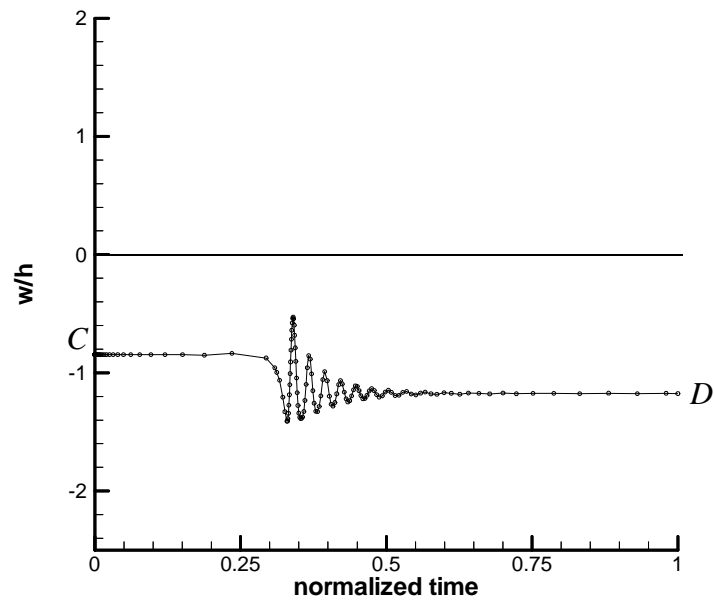
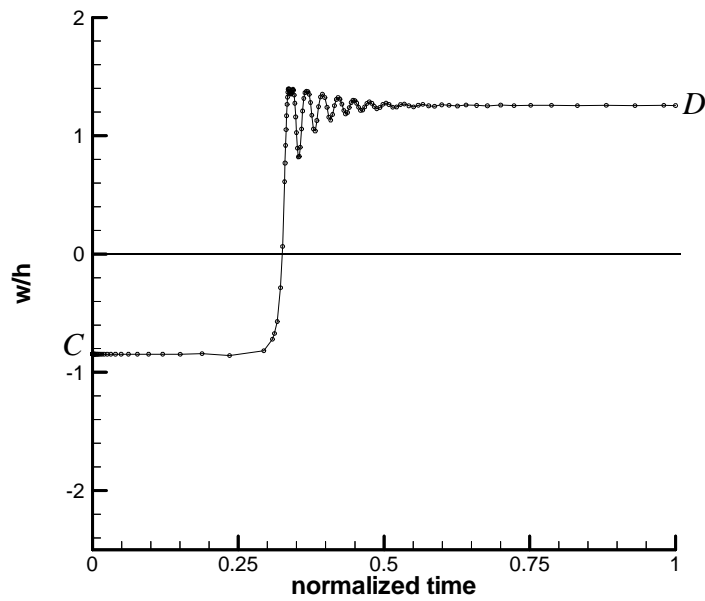


Fig. G.22 Transient response at II of a  $[30_2/90/0]_{2T}$  laminate (CL-SS)



Fig. G.23 Transient response at III of a  $[30_2/90/0]_{2T}$  laminate (CL-SS)Fig. G.24 Transient response at I of a  $[30_2/90/0]_{2T}$  laminate (CL-SS)

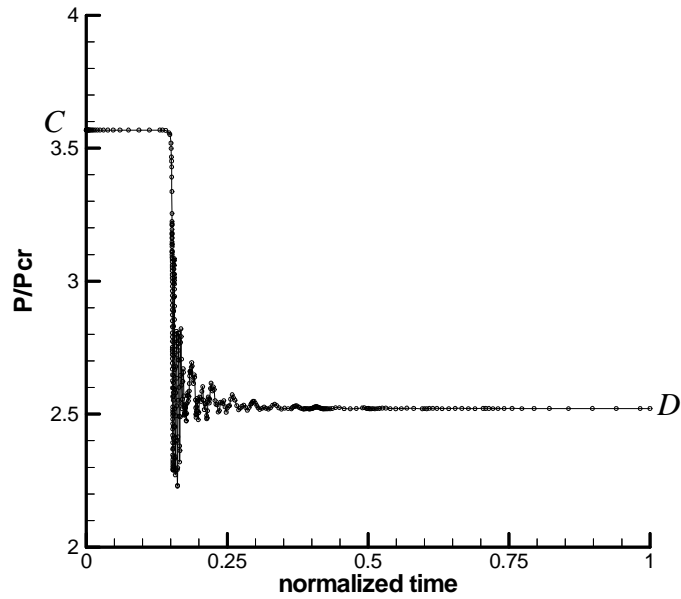


Fig. G.25 Transient load response of a  $[30_2/90/0]_{2T}$  laminate (SS-SS)

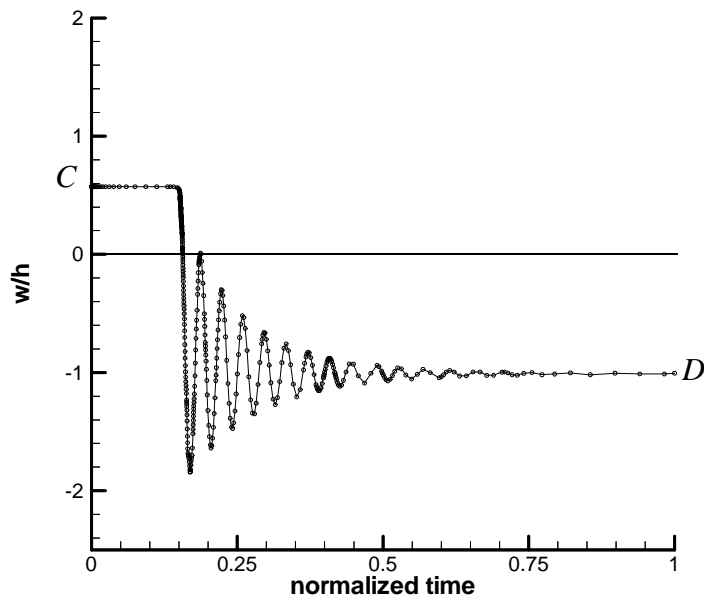


Fig. G.26 Transient response at II of a  $[30_2/90/0]_{2T}$  laminate (SS-SS)

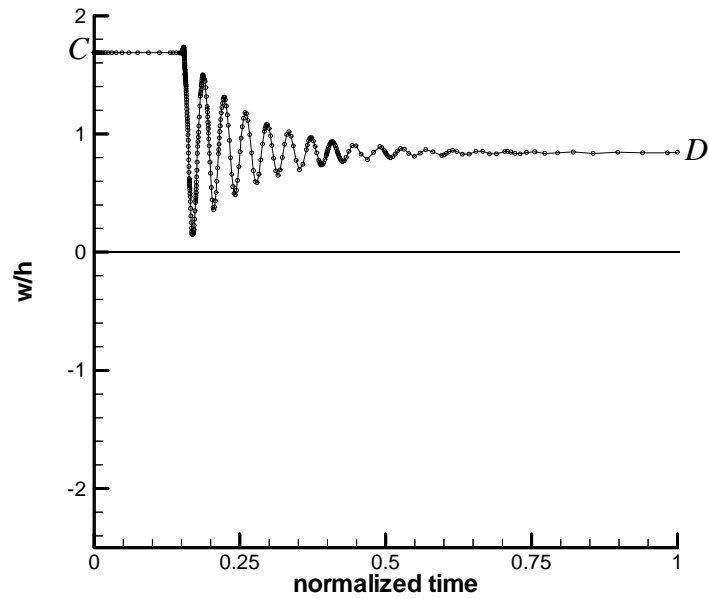


Fig. G.27 Transient response at III of a  $[30_2/90/0]_{2T}$  laminate (SS-SS)

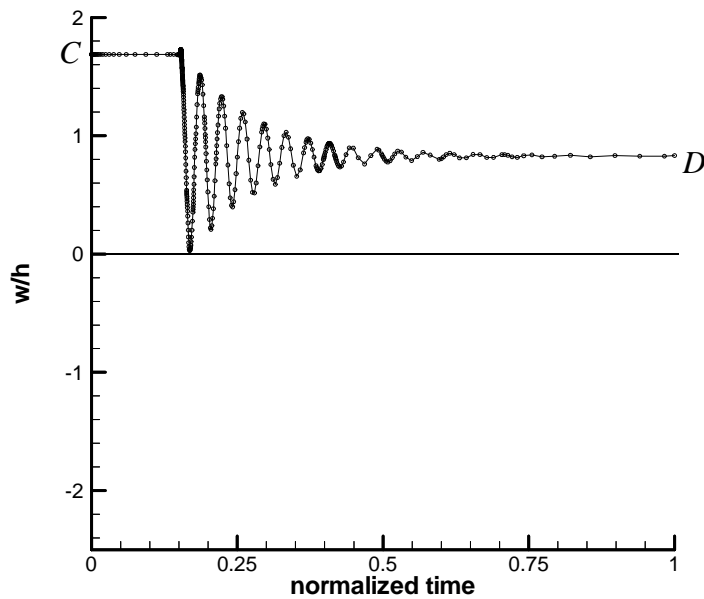


Fig. G.28 Transient response at I of a  $[30_2/90/0]_{2T}$  laminate (SS-SS)