Table 2 Separation solutions of the similar compressible laminar boundary-layer equations with mass transfer $\sigma = 1.0, f''(0) = 0, f(0) = 1.0$

g_w	$-\hat{\beta}$	$g'(0)$	$\delta_{tro}{}^*$	θ_{tr}
0	0.822459	1.075035	1.321262	0.488257
0.2	0.816288	0.871091	1.334238	0.485111
0.6	0.774632	0.444047	1.427348	0.468856
1.0	0.712041	0.0	1.586740	0.450854
2.0	0.555091	−1.144072	2.138149	0.420017

layer with mass transfer is integrated for the particular case of unit Prandtl number ($\sigma = 1$), a surface to stagnation enthalpy ratio $g_w = 2.0$, and a similar mass transfer parameter $f_w = 1.0$, i.e.,

$$f''' + ff'' + \hat{\beta}(g - f'^2) = 0 \tag{1}$$

$$g'' + fg' = 0 \tag{2}$$

with boundary conditions

$$f(0) = f_w = 1.0 \tag{3a}$$

$$f'(0) = 0 \tag{3b}$$

$$g(0) = g_w = 2.0 \tag{3c}$$

$$f'(\eta \to \infty) = g(\eta \to \infty) \to 1\dagger \tag{3d}$$

These solutions were obtained using the fourth-order Runge-Kutta Nachtsheim-Swigert technique discussed above. The results which are characteristic of reverse flow solutions are given in Table 3 and Figs. 1 and 2.

Table 3 Reverse flow solutions of the similar compressible laminar boundary-layer equations with mass transfer $\sigma = 1.0, g_w = 2.0, f(0) = 1.0$

$-\hat{\beta}$	$-f''(0)$	$-g'(0)$
0.555091	0	1.144072
0.566712	0.1	1.127216
0.573864	0.3	1.087995
0.553773	0.5	1.037012
0.482721	0.7	0.957077
0.4	0.782546	0.886807
0.3	0.793845	0.807186
0.2	0. 34598	0.722124
0.1	0.594141	0.615030
0.05	0.467890	0.536701
0.025	0.368227	0.478004

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† The notation is that of Reference 7.

Reply by Authors to David F. Rogers

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THE comments by David F. Rogers on Ref. 1 should be of value to those interested in extremely high degrees of accuracy. Our main purpose in developing the solutions presented there was to create the separation maps as displayed in Figs. 1, 2, 5, and 9 of Ref. 1. We were interested, predominantly, in obtaining the value of $\hat{\beta}$ at separation with accuracy adequate for engineering work and employment in local similarity analyses.

One observation made by Rogers should be clarified. With the numerical techniques employed, i.e., successive approximation, coupled with the specific initial guess chosen, $f'(\eta) = 1$,‡ no lower branch solutions can possibly be obtained. Careful inspection of the describing integral equations of Ref. 1 indicates that, with this initial guess, appearance of such solutions is precluded. This is not to say that with successive approximation the lower-branch solutions cannot be obtained; a different initial guess exhibiting lower-branch, reverse flow, behavior would probably be required.

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‡ Notation to the same as in Ref. 1.

Comment on "A Method for Extracting Aerodynamic Coefficients from Free-Flight Data"

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Introduction

IN a recent paper[1] Chapman and Kirk of NASA Ames Research Center developed a technique of finding the parameters of various differential equations from flight data. This method is an iterative one that does not require a closed-form solution of the differential equation and is conceptually much more attractive than older methods that employ fits of the data with combinations of damped sine waves. The Chapman-Kirk method does require lengthy calculations on a large computer, and thus it is desirable that it either can provide better results than the previously developed methods requiring less calculation or can be applied to differential equations that cannot be treated by other methods. In reviewing the paper, we note that only one of their four examples might be a realistic case of this class, i.e., a missile with nonlinear damping and static moments. A quasi-linear technique[2–4] can be used on this example, but Chapman and Kirk did not make a

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